CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
Kokapet(Village), Gandipet, Hyderabad, Telangana-500075. www.cbit.ac.in

ISO Certified 9001:2015

COMMITTED TO RESEARCH, INNOVATION AND EDUCATION 44 years

SCHEME OF INSTRUCTION AND SYLLABI

III and IV SEMESTERS

of

FOUR YEAR DEGREE COURSE

in

B.E. - COMPUTER SCIENCE AND ENGINEERING
(AICTE Model Curriculum with effect from AY 2022-23)

R-22 Regulation

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(An Autonomous Institution)
Affiliated to Osmania University
Kokapet Village, Gandipet Mandal, Hyderabad –500075. Telangana
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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

In line with AICTE Model Curriculum with effect from AY 2023-24

BE (Computer Science and Engineering)

SEMESTER -III

S.no	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours Per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1.	22CSC05	Data Structures	3	-	-	3	40	60	3
2.	22CSC06	Discrete Structures	3	1	-	3	40	60	4
3.	22CSC07	Digital Logic Design	2	1	-	3	40	60	3
4.	22ECC36	Basic Electronics and Sensors	2	1	-	3	40	60	3
5.	22EGM01	Indian Constitution And Fundamental Principles	2	-	-	2	-	50	No Credit
PRACTICALS									
6.	22CSC08	Data Structures and Algorithms Lab	-	-	3	3	50	50	1.5
7.	22ECC37	Basic Electronics and Sensors Lab	-	-	2	3	50	50	1
8.	22CSC09	IT Workshop	-	-	2	3	50	50	1
9.	22CSV01	Engineering Leadership(MOOCs)	-	1	-	3	50	50	1
10.	22CSI01	Internship – I	-	-	-	-	50	50	2
11.		Extra Academic Activities (EEA) -3	-	-	3	-	-	-	No Credit
Total			**12**	**4**	**10**	**-**	**410**	**540**	**19.5**
Clock Hours Per Week: 26									

L: Lecture **D: Drawing**

T: Tutorial **P: Practical/Project Seminar/Dissertation**

CIE: Continuous Internal Evaluation

SEE: Semester End Examination

22CSC05

DATA STRUCTURES

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basic knowledge of programming language such as python.

Course Objectives:

This course aims to:

1. Study various linear and non-linear data structures.
2. Understand the performance of operations on data structures.
3. Explore various searching and sorting techniques.

Course Outcomes:

Upon completion of this course, student will be able to:

1. Understand the basic concepts and types of data structures.
2. Analyze various linear and nonlinear data structures.
3. Identify the applications of linear and nonlinear data structures and significance of balanced search trees, hashing .
4. Evaluate various searching and sorting techniques.
5. Use appropriate data structures to design efficient algorithms.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 2	3	3	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 4	3	2	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 5	3	3	1	-	-	-	-	-	-	-	-	-	1	1	-

UNIT-I

Introduction: Data structures, Classification of data structures, Abstract Data Types, Analysis of Algorithms; **Recursion**: Examples illustrating Recursion (Factorial, Binary Search), Analyzing Recursive Algorithms; **Sorting:** Quick sort, Merge Sort, Selection Sort, Radix sort, Comparison of Sorting Algorithms.

UNIT–II

Stacks: Stack ADT, Applications of stack, Array based stack implementation**; Queues:** Queue ADT, applications of queues, Array based queue implementation, Double Ended Queues, Circular queues.

UNIT-III

Linked Lists: Introduction, Linked lists, Representation of linked list, types of linked list, singly linked lists, implementing stack with a singly linked list and Queue, Circular linked lists, doubly linked lists, Applications of linked lists.

UNIT-IV

Trees: General Trees, Binary Trees, Implementing Trees, Tree traversals; **Search Trees:** Binary Search Trees, Balanced search trees- AVL trees, B- trees; **Priority Queue and Heaps:** Priority queue ADT, Priority queue applications, Heap Trees, implementing a priority queue with a Heap, Heap Sort.

UNIT-V

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals.

Hashing: Introduction, Hash Functions-Modulo, Middle of Square, Folding, Collision Resolution Techniques-Separate Chaining, Open addressing,- LinearProbing, Quadratic Probing, Double Hashing.

Text Books:

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structure and Algorithms in Python", Wiley, 2021.
2. Narasimha karumanchi, "Data Structures and Algorithms Made Easy", Career Monk Publications, 2020
3. S. Sahni and Susan Anderson-Freed, "Fundamentals of Data structures in C", E. Horowitz, Universities Press, 2nd Edition, .
4. Reema Thareja, "Data Structures using C", Oxford University Press, 2nd Edition, 2014.

Suggested Reading:

1. D. S. Kushwaha and A K. Misra, “Data structures A Programming Approach with C”, PHI, 2nd edition, 2014.
2. Seymour Lipschutz, “Data Structures with C”, Schaums Outlines, MGH, Kindle Edition, 2017.
3. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018
4. D. Samantha, “Classic Data Structures”, Prentice Hall India, 2nd Edition, 2013

Online Resources:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

22CSC06

DISCRETE STRUCTURES

Instruction	3L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Objectives:
This course aims to:
1. Introduce Propositional and Predicate Logic.
2. Introduce various proof techniques for validation of arguments.
3. Develop an understanding of counting, functions and relations.
4. Familiarize with fundamental notions and applicability of graph theory and algebraic systems.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Describe rules of inference for Propositional and Predicate logic.
2. Demonstrate use of Set Theory, Venn Diagrams, relations, and functions in Real-world scenarios.
3. Model solutions using Generating Functions and Recurrence Relations.
4. Determine the properties of graphs and trees to solve problems arising in computer science applications.
5. Distinguish between groups, semi groups and monoids in algebraic systems

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	3	1	-	-	-	-	2	-	-	1	2	-
CO 2	3	3	1	3	-	-	-	-	-	-	-	1	1	2	-
CO 3	2	3	1	3	1	-	-	-	-	-	-	-	1	1	-
CO 4	3	3	2	3	1	-	-	-	-	-	-	1	2	2	3
CO 5	3	3	1	1	-	-	-	-	-	-	-	-	3	2	-

UNIT – I
Introduction to Propositional Calculus: Basic Connectives and Truth tables, Logical Equivalence: Laws of Logic, Logical Implication; Rules of Inference. Predicates: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems

UNIT – II
Sets: Sets and Subsets, Operations on sets and the Laws of Set Theory, Counting and Venn Diagrams. **Relations and Functions:** Cartesian Products and Relations. Partial ordering relations, POSET, Hasse diagrams, Lattices as Partially Ordered Sets, Equivalence relations. Pigeon hole principle.
Functions: Types of Functions, Composition of functions and Inverse of functions

UNIT – III
Fundamental Principles of counting: The Rules of Sum and Product, Permutations, Combinations, Binomial Theorem; **Generating Functions**: Generating Functions, Calculating Coefficient of generating functions; **Recurrence Relations:** The First Order Linear Recurrence Relation, Second Order Linear. Homogeneous Recurrence relations with constant coefficients, Non Homogeneous Recurrence relations.

UNIT – IV
Introduction to Graphs: Graphs and their basic properties- degree, path, cycle, Sub graphs, Complements and Graph Isomorphism, Euler trails and circuits, Hamiltonian paths and cycles, Planar graphs, Euler formula, Graph Coloring and Chromatic polynomial, Matching, Applications.
Trees: Definitions, Properties, Rooted Trees, Spanning Trees, Minimum Spanning trees: The Algorithms of Kruskal and Prim

UNIT - V
Algebraic Structures: Algebraic Systems, Examples and General Properties, Semi groups and Monoids. **Groups:** Definitions and Examples, Subgroups, Homomorphisms and cyclic groups

Text Books:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", An Applied Introduction, 5th edition, Pearson Education, 2016.
2. Rosen, K. H., "Discrete Mathematics and Its Applications", 8th Edition, ISBN10: 125967651X ISBN13: 9781259676512, 2019
3. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TATA Mc Graw-Hill Edition, 1995.

Suggested Reading:

1. Singh, S.B., "Discrete Mathematics", Khanna Book Publishing Company, New Delhi., 3rd Edition, 2019
2. R. K. Bisht, H. S. Dhami, "Discrete Mathematics", Oxford University Press, Published in 2015.
3. David D. Railey, Kenny A. Hunt, "Computational Thinking for the Modern Problem Solving", CRC Press, 2014
4. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 8th Edition, PHI, 1986

Online Resources:

1. https://nptel.ac.in/courses/111107058/
2. https://nptel-discrete-mathematics-5217

22CSC07

DIGITAL LOGIC DESIGN

Instruction	2L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:

This course aims to:

1. Understand the basic building blocks of digital hardware and various minimization techniques.
2. Analyse and design the Combinational and Sequential circuits.
3. Design the circuits using verilog HDL.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Demonstrate the number system conversions and simplify Boolean functions.
2. Recall basic theorems and properties of Boolean algebra to represent logical functions in canonical and Standard forms.
3. Analyze and simplify Boolean expressions using Karnaugh-maps and tabulation method.
4. Analyze and Design various combinational circuits and Sequential circuits using Verilog HDL.
5. Design different applications using registers and counters by applying state reduction methods.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	-	-	-	-	-	-	-	-	-	-	1	1	-	-
CO 2	2	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO 3	2	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO 4	2	3	-	2	3	-	-	-	-	-	-	1	2	1	-
CO 5	2	3	-	2	3	-	-	-	-	-	-	1	2	-	-

UNIT - I

Digital and Binary Numbers: Digital systems, Binary numbers, Number base conversions, Octal and Hexadecimal numbers, Complements of Numbers, Binary codes.

Boolean Algebra and logic Gates: Binary logic, Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

UNIT – II

Minimization of Switching Functions: Introduction, the map method, minimal functions and their properties, the tabulation procedure, the prime implicant chart.

NAND and NOR Gates: NAND Circuits, Two-level Implementation, Multilevel NAND Circuits, NOR Circuits. Exclusive OR Gates: Odd Function, Parity Generation and Checking.

UNIT- III

Combinational Logic Design: Combinational Circuits; Analysis **Procedure:** Derivation of Boolean Functions, Derivation of the Truth Table, Logic Simulation.

Design Procedure: Decoders, Encoders, Multiplexers - Designing Combinational Circuits using Multiplexers, Binary Adders, Adder-Subtractor, Binary Multiplier, HDL Representations – Verilog.

UNIT - IV

Sequential Circuits: Sequential circuit definitions, Latches, Flip Flops, Sequential circuit analysis, Sequential circuit design, Design with D Flip Flops, Designing with JK Flip-Flops, HDL representation for sequential circuits - Verilog.

UNIT – V

Sequence Detection and State Reduction Methods: Moore and Mealy state graphs for sequence detection, Methods for reduction of state tables, Methods for state assignment.

Registers: Registers, Shift registers.

Counters: Ripple counters, synchronous counters, and other counters.

Text Books:

1. Morris Mano M. and Michael D. Ciletti, “Digital Design, With an Introduction to Verilog HDL”, Pearson

5th edition, 2013.
2. ZVI Kohavi, "Switching and Finite Automata Theory", Tata McGraw Hill 2nd Edition, 1995.
3. Roth, Jr., Charles H., et al. "Fundamentals of Logic Design", Enhanced Edition, Singapore, Cengage Learning, 2020.

Suggested Reading:

1. Ronald J Tocci, Neal Widmer, Greg Moss, "Digital Systems: Principles and Applications", Pearson 11th Edition, 2011.
2. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL design, McGraw Hill 2nd Edition, 2009.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Prentice-Hall, 2nd Edition, 2003.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc21_ee39/preview

22ECC36

BASIC ELECTRONICS AND SENSORS

(Common for CSE and CSE - IOT & Cyber Security including Blockchain Technology)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Prerequisite: Concepts of Semiconductor Physics and Applied Physics.

Course Objectives:

This course aims to:

1. Describe semiconductor device's principles and understand the characteristics of junction diode and transistors.
2. Understand working principles of Analog to Digital and Digital to Analog conversion.
3. Understand Interfacing of various modules myRIO.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Identify various types of semiconductor devices for building electronic circuits.
2. Describe the operation of various sensors, data convertors and actuators.
3. Acquire the data from various sensors.
4. Analyse usage of sensors/actuators for the development of real-time applications.
5. Apply theoretical learning to implement practical real-time problems for automation.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	1	1	1	1	3	3	2	1	2	-	-	-
CO 2	3	3	3	1	1	1	1	2	3	2	2	2	2	-	1
CO 3	3	2	2	1	2	2	2	1	3	2	2	2	2	2	1
CO 4	3	3	3	3	1	2	2	2	3	2	2	2	0	-	-
CO 5	3	3	3	2	1	2	2	2	3	2	2	2	0	-	1

UNIT-I

Diodes and its Applications: Overview of Semiconductors, Characteristics of P-N Junction diode, current equation. Characteristics of Zener Diode , Voltage regulator, Half Wave, Full Wave: Center tap, Bridge Rectifiers.
Display Systems: Constructional details of C.R.O and Applications.

UNIT-II

Bipolar Junction Transistors: Classification, Bipolar Junction Transistors Configurations. CE, CB Characteristics, h-parameters, Analysis of BJT amplifier using h-parameters in CE, CB configuration.
Field Effect Transistor: Junction Field Effect Transistor: Principle of Operation, Characteristics of JFET and Operation of MOSFET

UNIT- III

Op-Amps Circuits: Basic Principle, Ideal, and practical Characteristics, Voltage Follower, Op-Amp parameters, Applications-Summer, Integrator, Differentiator, Instrumentation amplifiers, Logic Gates-IC's,
Data Converters: Specifications, DAC- Weighted Resistor, R-2R Ladder, ADC-Parallel Comparator., Successive Approximation and Dual Slope(Qualitative treatment Only).

UNIT-IV

Sensors: Definition, classification, Proximity Sensors **,** Tachogenerator as a Velocity, Optical encoder as motion and Strain Gauge as force Sensor; Temperature and light sensors, Collision Avoidance sensors
ROBOT Sensors: Sensors in robot – Touch sensors**;** Camera Systems in Machine: Camera Technology, History in Brief, Machine Vision versus closed Circuit Television (CCTV).
Actuators: Introduction, Types of actuators in IOT, Real life examples of actuators in IOT

UNIT-V

Hardware/software platforms: Introduction to LabVIEW, Data Acquisition System: hardware Overview of my RIO, Converting Raw Data Values to a Voltage.
Sensors Interfacing with my RIO: Introduction, Pin configuration, diagrams of thermistor, photo cell, hall effect, IR Range Finder, Bluetooth, Temperature Sensors.

Text Books:

1. Robert L.Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson Education, 9th Edition, LPE, Reprinted, 2006.
2. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.
3. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013.
4. Ed Doering, NI myRIO Project Essentials Guide, Feb. 2016.

Suggested Reading:

1. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
2. Anindya Nag, Subhas Chandra Mukhopadhyay, Jurgen Kosel, Printed Flexible Sensors: Fabrication, Characterization and Implementation, Springer International Publishing, Year: 2019, ISBN: 978-3-030-13764-9,978-3-030-13765-6.
3. User guide and specifications NI myRIO-1900.

22EGM01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

Instruction	2L Hours per week
Duration of End Examination	2 Hours
Semester End Examination	50 Marks
Credits	-

Course Objectives:

This course aims to:

1. Understand the history of framing of the Indian Constitution.
2. Aware them on Fundamental Rights, Duties and Directive Principles of State Policy.
3. Explore the organisation of Union Government, and functions of President and Prime Minister.
4. Gain an insight into the inter-functionality of Union Legislature and Judiciary.
5. Educate on the local governance and problems in development of rural and urban areas.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Understand the history of framing of the Indian Constitution and its features.
2. Assess the realisation of Fundamental Rights and Directive Principles of State Policy.
3. Analyse the challenges to federal system and position of the President and the Prime Minister in the Union Government.
4. Underline the role of the Legislature and the Judiciary in Union Government and their mutual relations.
5. Evolve the development of the local governments in India and assess the role of Collector in district administration.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	1	-	-	1	1	1	1	-	-	-	-	-	-
CO 2	-	-	2	-	-	3	2	2	1	-	-	-	-	-	-
CO 3	-	-	1	-	-	1	1	-	-	-	-	-	-	-	-
CO 4	-	-	1	-	-	1	1	-	-	-	-	-	-	-	-
CO 5	-	-	2	-	-	3	2	1	1	-	-	-	-	-	-

UNIT-I

Constitutional History and Framing of Indian Constitution: East India Company rule (1757-1857): Social, Economic, Political and Administrative impact of Company rule in India. British Rule (1858-1947): Indian National Movement, Government of India Acts 1909, 1919 and 1935, and Indian Independence Act 1947. Framing of the Indian Constitution: Constituent Assembly, Preamble and Salient Features.

UNIT-II

Fundamental Rights, Duties and Directive Principles of State Policy: The Fundamental Rights**:** Features and significance of Rights. Fundamental Duties: Importance and the legal status of Duties. Directive Principles of State Policy: Socialist, Gandhian and Liberal-intellectual principles, importance and relevance.

UNIT-III

Union Government and its Administration: Federalism: Division of legislative and financial powers between the Union and the State. Union Executive: Role and position of President, Prime Minister and Council of Ministers. Emergency Provisions: National Emergency, Constitutional Emergency and Financial Emergency.

UNIT-IV

Union Legislature and Judiciary: Union Legislature: Parliament of India-Composition and functions of Parliament, and Parliamentary Committees. Union Judiciary: Supreme Court of India-Composition and Functions.

UNIT-V

Local Self Governments : Rural Local Governments: Zilla Parishad- CEO and functions of Zilla Parishad, Mandal Parishad- Role of Elected and Officials, Gram Panchayat- Sarpanch, Secretary and Gram Sabha. Urban Local Governments: Structure and functions of Municipalities and Municipal Corporations. District Collector: Powers and functions of Collector.

Textbooks:

1. Ed Prof V Ravindra Sastry, "Indian Government & Politics", Telugu Akademy, 2nd edition, 2018.
2. NCERT, "Indian Constitution at Work"**,** First edition 2006, Reprinted in 2022.

Suggested Reading

1. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, Framing of Indian Constitution, 1st edition, 2015.
3. Granville Austin, The Indian Constitution: the Cornerstone of a Nation, OUP, 2nd Edition 1999
4. M.V. Pylee, India's Constitution, S. Chand Publishing, 16th Edition, 2017
5. Rajeev Bhargava (ed), Politics and Ethics of the Indian Constitution, OUP, 2008

Online Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

22CSC08

DATA STRUCTURES and ALGORITHMS LAB

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: Any Programming Language.

Course Objectives:

This course aims to:

1. Understand the basic concepts of data structures and abstract data types.
2. Describe linear and non-linear data structures.
3. Study various searching, sorting and hashing techniques.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Implement the abstract data type.
2. Implement linear and non-linear data structures.
3. Analyze various sorting techniques.
4. Analyze various algorithms of linear and nonlinear data structures.
5. Design and develop real world problem using suitable data structures.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 2	3	3	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 3	3	3	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 4	2	3	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 5	2	3	1	-	-	-	-	-	-	-	-	-	1	1	-

List of Experiments

1. Implementation of Searching and Sorting Algorithms
2. Implementation of Stacks
3. Implementation of Infix expression to Postfix expression conversion using Stack.
4. Implementation of Postfix expressions using stack.
5. Implementation of Queues
6. Implementation of Singly Linked List
7. Implementation of Binary Search Tree.
8. Implementation of Heap Sort.
9. Implementation of Graph Traversal Techniques.
10. Implementation of Hashing.
11. **Case studies** – Solve Data Structure algorithms in online platforms such as HackerRank and Codechef

Text Books:

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structure and Algorithms in Python”, Wiley, 2021.
2. Narasimha karumanchi, “Data Structures and Algorithms Made Easy”, Career Monk Publications, 2020

22ECC37

BASIC ELECTRONICS and SENSORS LAB

(Common for CSE and CSE - IOT & Cyber Security including Blockchain Technology)

Instruction	2P Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Prerequisite: Students should have prior knowledge of Applied Physics and Semiconductor Physics.

Course Objectives:

This course aims to:

1. Learn about various electronic components and devices.
2. Study the transistor characteristics in different modes.
3. Familiarize to use customizable software and modular measurement hardware to create user-defined measurement systems.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Familiarize with basic electronic components, devices, and systems.
2. Formulate the research problems associate with Transistor or Op-amp circuits
3. Examine the Interfacing of myRIO with various sensors/transducers, Motors.
4. Examine and Measure the problems encountered in Robotos or sensor related systems
5. Justify the solutions related with transistorized circuits for real-time applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	1	1	1	2	1	3	1	3	2	-	`1	-
CO 2	3	3	3	3	1	2	2	1	3	1	3	3	1	1	1
CO 3	3	3	3	3	2	2	3	2	3	2	2	3	1	1	1
CO 4	1	2	3	3	3	2	3	3	3	2	3	2	1	-	-
CO 5	1	2	3	3	3	2	3	3	3	2	3	2	-	1	1

List of Experiments:

1. Study of Semiconductor components, sensors, transducers.
2. Characteristics of Semiconductor Diodes.
3. CRO Applications
4. Half Wave Rectifier with and without filters.
5. Full Wave Rectifiers with and without filters
6. Voltage Regulator using Zener diode.
7. CB Input and Output Characteristics
8. FET Characteristics
9. Operational Amplifiers – Inverting Op-Amp, Adder.
10. Operational Amplifiers – Integrator, Differntiator.
11. Interfacing LDR/Photo Resistor and LED with myRIO (Intensity control of LED with respect to Illumination).
12. Interfacing LM35, Thermistor, and Buzzer with myRIO. (Temperature Thresholding Application)
13. Interfacing IR Range Finder with myRIO. (Obstacle detection and Ranging)
14. Interfacing Motor with Motor Adapter using myRIO. (Motor momentum control)
15. Interfacing Accelerometer and Inbuilt accelerometer with myRIO. (Vibration calculation in specific axis)
16. **Structured Enquiry:** Design a switching circuit using BJT and analyse its operation.
17. **Open ended Enquiry:** Design a LED running lights circuit for vehicles to avoid accidents in fog/rain condition.

Note: At least 12 experiments are to be performed.

Suggested Reading:

1. Paul B. Zbar, Albert P.Malvino, Michael A. Miller, “Basic Electronics, a Text- Lab Manual”, 7th Edition, TMH, 1994.
2. PaulB. Zbar, “Industrial Electronics, aText- Lab Manual”, 4th Edition, 2008.

3. Jeffrey Travis and Jim Kring, “LabVIEW for Everyone: Graphical Programming Made Easy and Fun”, 3rd Edition, Prentice Hall, 2007.
4. Ed Doering, NI myRIO Project Essentials Guide, Feb. 2016

With effect from AY 2023-24

22CSC09

IT WORKSHOP

Instruction	2P Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives:

This course aims to:

1. Familiarize the students with documentation and visualization tools like LaTeX.
2. Develop proficiency in documentation for presentation and report writing.
3. Explore the utilities in LaTeX.

Course Outcomes:

Upon completion of this course, student will be able to:

1. Understand the need of documentation tools.
2. Install the documentation tools.
3. Generate templates for generation report using LaTeX
4. Generate templates for presentation reports using Beamer.
5. Explore the utilities of LaTeX.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	1	2	1	-	-	-	-	-	1	1	-	1
CO 2	1	1	2	1	3	1	-	-	-	-	-	1	1	-	1
CO 3	2	3	3	2	3	1	-	-	1	-	-	1	2	-	1
CO 4	2	3	3	2	3	1	-	-	1	-	-	1	2	-	1
CO 5	1	1	2	1	2	1	-	-	1	-	-	1	1	-	1

Lab Experiments:

1. Exploring various environments and Installation of LaTeX.
2. Understanding LaTeX compilation, basic syntax.
3. Create a LaTeX document with various formatting styles.
4. Understand Page Layout –Titles, abstract, chapters, sections, references, equation, references, citation, table of contents, generating new commands.
5. Create a LaTeX document with following mathematical equations along with equation numbers in Italic format: Ex-summation (represent in sigma symbol), integration, integral of summation.
6. Create a LaTeX documents with images and image caption at centre alignment, table with thick border and table caption with centre alignment, row height, content with cell centre alignment.
7. Create a LaTeX document to write an algorithm using algpseudocode and algorithm packages. Use the lstlisting package in LaTeX to write source code in any programming language .
8. Work on basic power point utilities and tools in LaTeX which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows Beamer, slides preparation.
9. Create a Resume, Lab Report, Article.
10. Create a technical report according to IEEE format includes title of the paper, authors name and affiliations, abstract and keywords, introduction section, background section, and other sections, references.

Text Books:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education India,2005
2. LaTeX Companion – Leslie Lamport, PHI/Pearson,2004.

Online Resources:

1. https://www.latex-project.org/help/documentation/
2. https://spoken-tutorial.org/tutorial ef,search?search_foss=LaTeX& search_language=English

22CSV019

ENGINEERING LEADERSHIP

Instruction	1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives:

This course aims to:

1. Prepare students to assume engineer-leader roles in their professional careers, whether in the private ,academic, public, or non-profit sectors
2. Assist students in describing and applying the foundations of leadership to their individual leadership framework, with linkage to vision, high ethical standards and professionalism.
3. Assist students in developing their effective communications and presentation skills
4. Provide students with a background in applying concepts to manage collaborative team dynamics, drive change, and manage conflicts and crises.

Course Outcomes:

Upon completion of this course, student will be able to:

1. Understand engineer-leader roles to be played in professional careers.
2. Acquire leader skills that are required for professional career.
3. Use assessment tools to identify the strengths and weaknesses and analyze the impact on leadership style.
4. Develop stress management skills to improve leadership styles
5. Develop the attitude of creativity in problem solving.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	1	-	1	-	1	2	1	2	1	-	-	1
CO 2	1	1	1	1	-	1	-	1	3	2	3	1	-	-	2
CO 3	1	1	2	2	3	1	-	1	2	2	3	1	-	-	2
CO 4	1	2	3	2	2	1	-	1	3	3	3	2	-	-	2
CO 5	1	2	3	2	2	1	-	1	3	3	3	2	-	-	2

UNIT-I

Introduction to Leadership: Functions, leadership roles, leadership skills and styles, leadership competency framework, methodology for assessing skill levels.

UNIT-II

Engineering Profession: Engineering challenges, Time management strategies and toolboxes.

UNIT-III

Self-Awareness: An introduction to self-assessment tools that allow identifying strengths and weaknesses and impact analysis on leadership style.

UNIT-IV

Stress Management: Strategies to limit or leverage stress to improve leadership style, tools for effective stress management.

UNIT-V

Creative Problem Solving: Differences between analytical and creative problem solving. Techniques for encouraging creativity in solving problems while recognizing and overcoming conceptual blocks.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc19_mg34/preview
2. https://www.coursera.org/learn/self-awareness#syllabus

22CSI01

INTERNSHIP-I

(MOOCs/Training/Internship)

Instruction	90 hours
Continuous Internal Evaluation	50 Marks
Credits	2

Course Objectives:

This course aims to:

1. Exposing the students to the industrial environment and technologies
2. Provide possible opportunities to learn, make them to understand and sharpen them to the real time technical/ managerial skills required at the job
3. Expose with the current technological developments relevant to program domain
4. Understand Engineer's responsibilities and ethics
5. Opportunity to interact with the people of industry/society to understand the real conditions.

Course Outcomes:

Upon completion of this course, student will be able to:

1. Learn new technologies and solve real time projects.
2. Expose to the industrial environment problems and technologies
3. Gain knowledge on contemporary technologies industrial requirements.
4. Identify , Design and Develop solutions for real world problems
5. Communicate their ideas and learning experiences through reports and presentation.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	2	2	1	1	3	2	3	3	3	2	3
CO 2	2	2	2	1	1	2	2	1	3	2	3	3	3	2	3
CO 3	3	2	1	1	1	2	2	1	2	2	3	3	3	2	2
CO 4	2	3	3	3	1	2	1	-	3	3	3	3	3	2	3
CO 5	1	1	1	1	1	1	-	-	2	3	3	3	2	1	3

Process to be followed for carrying out Instructions to Students:

1. Students may apply for internships through the AICTE Portal or through CDC of the institute by filling the application form IAP-101.
2. Industry shall scrutinize the students based on their criteria and communicate a provisional offer or confirmation letter to the student.
3. If students apply through CDC, then CDC shall nominate the students for various opportunities accordingly by issuing NOC (IAP-104).
4. The respective head of the department shall assign a faculty mentor.
5. Student shall undergo internship/industrial training at the concerned Industry/Organization by submitting the form, IAP-103.
6. During the internship, Faculty Mentor will evaluate the performance of students twice either by visiting the Industry/Organization or through obtaining periodic reports from students.
7. Student shall submit internship report to the industry/organization at the end of internship program.
8. On successful completion of the Internship, Industry/Organization shall issue Internship Certificate to the students
9. All the students should maintain discipline, professional ethics and follow the health and safety precautions during internship

Student shall maintain diary during the internship and submit the internship report at the end of the internship. The report will be evaluated by the supervisor on the basis of the following criteria:

- Originality
- Adequacy and purposeful write-up
- Organization, format, drawings, sketches, style, language etc.
- Variety and relevance of learning experience
- Practical applications, relationships with basic theory and concepts taught in the course

Evaluation of Internship: The internship of the students will be evaluated in three stages:

a. Evaluation by the Industry (in the scale of 1 to **10** where 1-Unsatisfactory; 10-Excellent)
b. Evaluation by faculty Mentor on the basis of site visit(s) or periodic communication (**15** marks)
c. Evaluation through seminar presentation/Viva-Voce at the Institute(This can be reflected through marks assigned by Faculty Mentor (**25 marks**)

For further details regarding templates, assessment guidelines please refer to the document from page number 16 onwards available at: https://www.cbit.ac.in/wp-content/uploads/2019/04/R22-Rules-with-internship-guidelines-10-11-2022..pdf.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

In line with AICTE Model Curriculum with effect from AY 2023-24

BE (Computer Science and Engineering)

SEMESTER -IV

S.no	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours Per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1.	22CSC10	Computer Organization and Architecture	3	1	-	3	40	60	4
2.	22CSC11	Database Management Systems	2	1	-	3	40	60	3
3.	22CSC12	Formal Language and Automata Theory	2	1	-	3	40	60	3
4.	22MTC12	Probability and Statistics	3	1	-	3	40	60	4
5.	22ITC17	Web Technologies	2	1	-	3	40	60	3
6.	22ECC39	Systems and Signal Processing	2	1	-	3	40	60	3
PRACTICALS									
7.	22ITC18	Web Technologies Lab	-	-	3	3	50	50	1.5
8.	22CSC13	Database Systems Lab	-	-	3	3	50	50	1.5
9.		Extra Academic Activities (EEA)-4	-	-	3	-	-	-	-
Total			**14**	**6**	**9**	**-**	**340**	**460**	**23**
Clock Hours Per Week: 29									

L: Lecture **D: Drawing**

T: Tutorial **P: Practical/Project Seminar/Dissertation**

CIE: Continuous Internal Evaluation

SEE: Semester End Examination

22CSC10

COMPUTER ORGANIZATION and ARCHITECTURE

Instruction	3L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Digital Logic Design

Course Objectives:
This course aims to:

1. The course aims to introduce principles of computer organization and basic architectural concepts.
2. It begins with the basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
3. Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and I/O systems, and multiprocessors

Course Outcomes:
Upon completion of this course, student will be able to:

1. Understand the basics of instructions sets and their impact on processor design
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor
4. Design a pipeline for consistent execution of instructions with minimum hazards
5. Understand how to perform computer arithmetic operations, pipeline procedures, and multiprocessors

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	-	-	-	-	-	-	-	-	-	1	-	-	2
CO 2	2	1	1	-	-	-	-	-	-	-	-	1	-	-	2
CO 3	2	1	1	1	-	-	-	-	-	-	-	1	-	-	2
CO 4	2	1	1	-	-	-	-	-	-	-	-	1	-	-	2
CO 5	2	1	1	-	1	-	-	-	-	-	-	1	-	-	2

UNIT–I
Introduction to Computer Architecture: Introduction to Computer Architecture, Flynn's Classification of Computers, Performance Metrics (like Latency, throughput), Fundamental Blocks of Computer (like CPU, I/O subsystems, memory, control unit).

UNIT–II
Instruction Set Architecture (ISA): Introduction to Instruction Set Types of ISA; RISC, CISC., Registers, Common bus structure, Instruction Execution Cycle, Addressing Modes, Register Transfer Language (RTL), 8086 Architecture, ARM Architecture.

UNIT–III
Data Representation: Data Type Representation, Floating-point Addition, Multiplication, Division.

UNIT–IV
Pipelining: Pipelining (Basics, Types, stalling, and forwarding), Throughput and Speedup of Pipelining, Pipelining Hazards

UNIT–V
Data Level parallelism: Data Level Parallelism (DLP) (Introduction, Loop Level Parallelism), Vector Architecture, SIMD Instruction Set: Used for Multimedia, Graphics Processing Unit (GPU) (Introduction, GPU Memory Hierarchy), CUDA Programming (Introduction, Code samples of PDA and FPGA)

Text Books:

1. J.L. Hennessy and D.A. Patterson, "Computer Architecture: A Quantitative Approach", 5th edition, Morgan Kauffmann Publishers, 2012.
2. M. Morris Mano, "Computer System Architecture", Pearson Publication, 3rd edition,2017.
3. Jon Stokes, "Inside the Machine: An Illustrated Introduction to Microprocessors and Computer Architecture", No Starch Press, 1st edition, 2015.

4. Noam Nisan and Shimon Schocken, "The Elements of Computing Systems: Building a Modern Computer from First Principles", The MIT Press, 2nd edition, 2021.

Suggested Reading:

1. Car Hamacher, Zvonks Vranesic, Safea Zaky, "Computer Organization", McGraw Hill, 5th Edition, 2011.
2. William Stallings, "Computer Organization and Architecture", Pearson/PHI, 6th Edition, 2007.
3. Andrew S. Tanenbaum, "Structured Computer Organization", PHI/Pearson, 6th Edition, 2013.

Online Resources:

1. http://www.geeksforgeeks.org/computer-organization-and-architecture-gq/
2. https://www.cs.virginia.edu/c++programdesign/slides/pdf/bw01.pdf
3. ttps://www.tutorialspoint.com/computer_organization/index.asp
4. https://sites.google.com/site/uopcog/

With effect from AY 2023-24

22CSC11

DATA BASE MANAGEMENT SYSTEMS

Instruction	2L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Discrete mathematics of computer science, Programming and Data Structures.

Course Objectives:
This course aims to:
1. Familiarize students with fundamental concepts of database management. These concepts include aspects ofdatabase design, database languages and database-system implementation.
2. Understand about data storage techniques and indexing.
3. Impart knowledge in transaction management, concurrency control techniques and recovery procedures.

Course Outcomes:
Upon completion of this course, student will be able to:
1. Design database schema for an application using RDBMS concepts.
2. Write SQL queries for tasks of various complexities.
3. Build applications using database system as backend.
4. Understand internal working of a DBMS including data storage, indexing, query processing, transaction processing, concurrency control and recovery mechanisms.
5. Analyze non-relational and parallel/distributed data management systems with a focus on scalability.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	2	3	-	-	-	-	-	-	1	2	2	3
CO 2	2	3	2	2	3	-	-	-	-	-	-	1	2	2	2
CO 3	2	1	2	1	3	-	-	-	-	-	-	-	2	3	2
CO 4	2	1	1	-	-	-	-	-	-	-	-	-	3	3	3
CO 5	2	1	-	1	-	-	-	-	-	-	-	-	3	3	2

UNIT - I
Introduction: Motivation, Introduction to Data Models (Relational, Semi structured, ER).
Relational Data Bases: Relational Data Model, Relational Algebra, Relational Calculus .

UNIT - II
SQL + Interaction with Database: SQL Data Types, Basic Structure of SQL Queries, Modification of the Database, Set Operations, Aggregate Functions, Data-Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL. Simple Queries (select/project/join/ aggregate queries), Complex queries (With Clause, Nested Subqueries, Views), Programming in a standard language and interfacing with a DB backend.

UNIT- III
Big Data: Key-value Stores and Semi structured Data, using JSON and MongoDB, or other combinations
Database Design: Introduction to ER model, Mapping from ER to relational model, Functional Dependencies, Normalization.

UNIT - IV
Physical Design: Overview of Physical Storage (Hard Disks, Flash/SSD/RAM), sequential vs random I/O, Reliability via RAID, Storage Organization (Records, Pages and Files), Database Buffers, Database Metadata, Indexing, B+-Trees.

UNIT - V
Query Processing and Optimization: Query Processing, External sort, Joins using nested loops, indexed nested loops; **Overview of Query Optimization:** Equivalent expressions, and concept of cost based optimization; **Transaction Processing:** Concept of transactions and schedules, ACID properties, Conflict-serializability; **Concurrency control:** locks, 2PL, Strict 2PL, optional: isolation levels, Recovery using undo and redo logs.

Text Books:

1. Silberschatz, Korth and Sudarshan, "Database System Concepts", 7th Edition, McGraw-Hill, 2021
2. Elmasri and Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Pubs, 2017
3. Lemahieu, Broucke and Baesens, "Principles of Database Management", Cambridge University Press, 2018
4. RP Mahapatra, "Database Management Systems", Khanna Publishing House, 2020.
5. Krishnan, "Database Management Systems", McGraw Hill.

Suggested Reading:

1. MySQL Explained: Your Step By Step Guide To Database Design
2. Pro SQL Server 2008 Relational Database Design and Implementation (Expert's Voice in SQL Server) 1st Edition

Online Resources:

1. http://www.nptelvideos.in/2012/11/database-managementsystem.html.
2. https://www.oracle.com/news/connect/json-database-semistructured-sql.html

22CSC12

FORMAL LANGUAGE AND AUTOMATA THEORY

Instruction	2L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Discrete Mathematics, Data Structures, Design and Analysis of Algorithms

Course Objectives:
This course aims to:
1. Identify the hierarchy of formal languages, grammars, and design finite automata to accept a set of strings of a language.
2. Examine regular expressions, context free grammars and normal forms.
3. Study equivalence of languages accepted by Push down Automata and distinguishes between Computability Vs Non-computability and Decidability Vs Undecidability.

Course Outcomes:
Upon completion of this course, student will be able to:
1. Describe language basics like Alphabet, strings, grammars, productions, derivations, and Chomsky hierarchy.
2. Recognize regular expressions, formulate, and build equivalent finite automata for various languages.
3. Identify closure, decision properties of the languages and prove the membership.
4. Demonstrate context-free grammars, check the ambiguity of the grammars and design equivalent PDA to accept.
5. Use mathematical tools, abstract machine models to solve complex problems and distinguish decidable and undecidability of a problem.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO 2	2	2	1	1	-	-	-	-	-	-	-	-	1	-	-
CO 3	2	2	-	1	-	-	-	-	-	-	-	-	1	-	-
CO 4	2	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO 5	2	3	1	1	-	2	-	-	-	-	-	1	2	-	-

UNIT–I
Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages. **Finite automata**: Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA) and equivalence with DFA, Equivalence and Minimization of Automata, Introduction to Mealy and Moore machine.

UNIT–II
Regular Expressions, Languages and Finite Automata: Converting DFA's to Regular Expressions by eliminating states, Converting Regular Expressions to Automata, Applications of Regular Expressions, Algebraic Laws for Regular Expressions. **Properties of Regular Languages:** The pumping lemma for Regular Languages, Applications of Pumping Lemma, Closure Properties and Decision Properties of Regular Languages.

UNIT–III
Context-free Languages and Pushdown Automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

UNIT–IV
Context-sensitive Languages: Context-sensitive grammars (CSG), linear bounded automata and equivalence with CSG. **Turing Machines:** The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs.

UNIT–V

Unrestricted grammars and equivalence with Turing machines, TMs as enumerators.
Undecidability: Universal Turing machine, Diagonalization Languages, reduction between languages and Rice s theorem, PCP and Modified PCP, Various translators.

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffery D Ullman, "Introduction to Automata Theory Languages and Computation", Pearson Education, 3rd edition, 2012.
2. Michael Sipser, "Introduction to the Theory of Computation", PWS Publishing, 3rd edition, 2012

Suggested Reading:

1. Harry R. Lewis and Christos H. Papadimitriou, "Elements of the Theory of Computation", Pearson Education Asia. 2003.
2. John C Martin. "Introduction to Language and Theory of Computation", TMH, 3rd edition, 2007.
3. Daniel Cohen, "Introduction to Computer Theory", Wiley Publications, 2nd edition, 2007.
4. Mishra K., Chandrasekaran N., "Theory of Computer Science (Automata, Languages and Computation)", Prentice Hall of India, 3rd edition, 2008.
5. Shyamalendra Kandar, "Introduction to Automata Theory, Formal Languages and Computation", Pearson, 1st edition, 2013.
6. Kamala Krithivasan, Rama R. "Introduction to Automata Theory, and Computation", Pearson, 1st edition, 2009.

Online Resources:

1. http://courses.cs.vt.edu/cs4114/spring2012/index.php
2. www.pearsoned.co.in/KamalaKrithivasan

22MTC12

PROBABILITY AND STATISTICS

Instruction	3L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Objectives:
This course aims to:

1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to learn methods to solve bivariate probability functions..
3. To explain hypothetical data using probability distribution
4. To discuss the testing of hypothesis of sample data.
5. Able to formulate and get the solution of real world problem.

Course Outcomes:
Upon completion of this course, student will be able to:

1. Analyze the coefficient of skewness and fitting of the data by various methods
2. Estimate the marginal probabilities of statistical averages.
3. Use the basic probability for fitting the Random phenomenon.
4. Apply various tests for testing the significance of sample data.
5. Analyse the random phenomena of real world data.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	-	-	-	-	-	-	-	2	2	1	-
CO 2	3	3	2	3	-	-	-	-	-	-	-	2	2	1	-
CO 3	3	3	2	3	-	-	-	-	-	-	-	2	2	1	-
CO 4	3	3	3	3	-	-	-	-	-	-	-	2	2	1	-
CO 5	3	3	2	3	-	-	-	-	-	-	-	2	2	1	-

UNIT-I

Basic Statistics : Measures of Central Tendency, Measures of Dispersion, Moments (Moments about the mean and moments about a point). Skewness, Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness for frequency distribution, Kurtosis. Correlation, coefficient of correlation, limits of correlation coefficient. Linear Regression, Regression coefficients, Properties of Regression Coefficients. Curve fitting by the Method of Least Squares, Fitting
of Straight lines and Exponential curve.

UNIT-II

Univariate and Bivariate Distribution: Conditional Probability, Baye's theorem. Random variable, discrete random variable, Probability Mass Function, continuous random variable, probability density function. Mathematical expectation, properties of Expectation, properties of variance and co-variance. Two-dimensional or Joint Probability Mass Function, Two-dimensional Distribution Function, , Joint Density Function, Marginal Density Function, The Conditional Distribution Function, and Conditional Probability Density Function, Stochastic Independence ,

UNIT-III

Probability Distributions: Discrete probability distribution: Poisson distribution, Mean, Variance, MGF, CGF, fitting of Poisson distribution. Continuous probability distributions: Normal distribution, Standard Normal random variable Expectation, Variance, MGF (with out proof), CGF, Properties of Normal Curve and Areas under Normal curve. Exponential distribution, Expectation, Variance, MGF, CGF.

UNIT-IV

Testing of Hypotheses: Test of significance, null and alternative hypotheses, Errors in sampling, level of significance. Large sample test: Test of significance for single proportion, difference of proportions, single mean and difference of means. Small Sample Tests: T-Test for single mean, differences of Means. F- test for equality of two population variances. Chi-Square test.

UNIT-V

Analysis of Variance and Time Series: One way classification-Assumptions for ANOVA Test-ANOVA for fixed effect model-Two way classification-ANOVA for fixed effect model-Components of Time series-Measurement of Trend- Method of semi Averages- Moving Averages Method.

Text books:

1. S.C.Gupta, V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. Sheldon Ross, "A First Course in Probability", Pearson publications, 9th Edition, 2014.

Suggested Reading:

1. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 3rd Ed., 1968.
2. S.C.Gupta, V.K.Kapoor, "Fundamentals of Applied Statistics", Sultan Chand and Sons, 2014.

With effect from AY 2023-24

22ITC17

WEB TECHNOLOGIES

Instruction	2L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:

This course aims to:

1. Understand how HTML, CSS, JavaScript and Bootstrap work together.
2. Explore various features of JS and its functionality.
3. Understand basics of MongoDB and its Data Model.
4. Comprehend the new features of JS, role of React JS in responsive web application development.
5. Familiarize with configuration of NPM and backend integration with NODE JS and Express JS.

Course Outcomes:

Upon completion of this course, student will be able to:

1. Create web pages with good aesthetic sense of design using HTML CSS3, Bootstrap and popular themes.
2. Use JS in Validations and DOM manipulation.
3. Design Schema and perform CRUD operations from UI components.
4. Become an agile practitioner with the ability to quickly complete projects using ReactJS.
5. Build an end-to-end application from scratch using React JS, NODE JS, Express JS and Mongo DB.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	3	1	1	-	-	-	1	1	1	1	3	-	3
CO 2	2	1	2	1	2	-	-	-	-	-	1	-	2	-	3
CO 3	2	1	2	2	1	-	-	-	-	-	-	-	3	-	3
CO 4	2	1	1	1	1	-	-	-	-	-	-	1	1	-	3
CO 5	2	1	1	1	1	-	-	-	-	-	-	1	1	-	3

UNIT-I

Introduction: Web Fundamentals, **HTML 5.0:** basic tags, Images, Tables, Lists, Forms, Layout, Graphics, span and div tags. Grid, **Introduction to Cascading Style Sheets:** Types of CSS**,** text and font, color**,** CSS Selectors, CSS BOX Model, CSS Positioning, and CSS floating.

Bootstrap: Introduction of Bootstrap, Container and Container-fluid, Jumbotron, Grid, Table, Form, Alert, Navbar, Modals.

UNIT-II

Java Script: Introduction, data types, control structures, functions, arrays, objects, regular expressions, working with events, form validation, DOM Elements, Accessing and modifying Elements using DOM, Dynamic document with Java script.

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UNIT-III

MongoDB: Introduction, Importance of NoSQL databases, Data types, Documents, nested Documents, CRUD Operations, Basic cursor methods: map, to Array, pretty, for Each, limit, count, sort, Columnar Databases, Indexing and Aggregation, MongoDB Node JS Drivers and CAP theorem.

UNIT-IV

ReactJS: ES5 vs Es6, Scoping - var vs let vs const, Arrow functions, Use of this keyword (lexical scoping), Spread & rest parameter, Array & object destructure, module import and export, State, Props, Components, Lifecycle, Stateful and stateless components, Events, Router, Forms, Tables, Portals, CSS, Hook and new Features added in recent versions.

UNIT-V

NodeJS: Creating Web Server, Functions, Buffer, Node Modules, Creating Web Server, Handling HTTP requests; **ExpressJS:** API methods - GET, POST, PUT, DELETE, Request & response objects, URL and Query parameters, Routing, Templates, middleware and the model-view-controller pattern.

Text Books:

1. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node", second Edition, Apress Publications, 2019.
2. David Hows, Peter Membrey, EelcoPlugge – "MongoDB Basics", Apress, 2014.

Suggested Reading:

1. Ethan Brown, "Web Development with Node and Express", Oreilly Publishers, First Edition, 2014.
2. Shelly Powers, "Learning Node: Moving to the Server-Side", 2nd Edition, O"REILLY, 2016.
3. Simon D. Holmes and Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", Second Edition, Manning Publications, 2019
4. Brad Dayley, "Node.js, MongoDB and Angular Web Development", 2nd Edition, Addison-Wesley Professional, 2017.

Online Resources:

1. https://web.stanford.edu/class/cs142/index.html
2. https://nodejs.org/en/docs/
3. https://www.mongodb.com/
4. https://reactjs.org/
5. https://getbootstrap.com/docs/5.0/utilities/api/
6. https://edu.anarchocopy.org/Programming%20Languages/Node/Pro%20MERN%20Stack,%202nd%20Edition.pdf

22ECC39

SYSTEMS AND SIGNAL PROCESSING

(Common to CSE, AI&DS, AI & ML)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Prerequisite: Knowledge of Differential and Integral Calculus.

Course Objectives:

This course aims to:

1. Know Signals and systems representation/classification and also the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms.
2. Understand Sampling, time and frequency domain analysis of discrete time signals with DTFT, DFT and Z-Transforms.
3. Understand concepts of convolution integrals.

Course Outcomes:

Upon completion of this course, student will be able to:

1. Classify signals, analyse the signals using Transform techniques.
2. Evaluate signal characteristics in frequency domain.
3. Assess the system stability and causality using ROC and Pole-Zero Plot.
4. Classify systems and analyse the signals using Transform techniques
5. Describe and analyse the DT Signal/systems using DFT, DCT, DWT, FFT and Z-Transform.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	3	-	-	-	-	-	-	-	1	1	-	1
CO 2	3	3	3	3	-	-	-	-	-	-	-	1	1	-	1
CO 3	3	3	3	3	-	-	-	-	-	-	-	1	1	-	1
CO 4	3	3	3	2	-	-	-	-	-	-	-	1	1	-	1
CO 5	3	2	1	2	-	-	-	-	-	-	-	1	1	-	1

UNIT-I

Continuous Time Signals: Introduction to signals, signal representations and classification.
Fourier Series: Exponential Fourier series, Amplitude and Phase spectra. Power Spectral Density.

UNIT-II

Fourier Transforms: Direct Fourier transforms, Inverse Fourier transforms, Existence, Frequency spectrum and properties of Fourier Transforms, FT of basic signals, Energy Spectral Density.

UNIT-III

Laplace Transforms: Laplace transforms. Region of convergence and its properties. Properties of Laplace transform, Inverse Laplace transform, Laplace transform of periodic signals.

UNIT-IV

Z–Transform: Direct Z-Transform, Region of convergence and its properties. Z–Transform properties. Inverse Z–Transform, Discrete Fourier Transform, Properties of Discrete Fourier Transform, FFT, DCT and DWT

UNIT-V

Continuous & Discrete Systems: Introduction to systems, System classifications-Linear, Causal, Stable, Time-invariant, Impulse response, System transfer function, Distortion less system, Non-linear systems- Filters

Text Books:

1. B. P. Lathi, "Signals, Systems and Communications", BS Publications, 3rd Edition, 2008.
2. Simon Haykin, "Signals and Systems", Wiley India, 5th Edition,2009.

Suggested Reading:

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawad, "Signals and Systems", PHI 2nd Edition, 2015.
2. M. J. Robert, "Fundamentals of signals and systems", McGraw Hill, 2008.

With effect from AY 2023-24

22ITC18

WEB TECHNOLOGIES LAB

Instruction	3P Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Course Objectives:

This course aims to:

1. To build Strong expertise to develop front end application using HTML5 and CSS3.
2. To become proficient in Bootstrap concepts.
3. To comprehend NoSQL Databases and MongoDB
4. To understand core features of JavaScript and React JS.
5. To learn Express JS and Node JS frameworks to develop responsive web applications.

Course Outcomes:

Upon completion of this course, student will be able to:

1. Build interactive and user-friendly static frontend UI applications using HTML, CSS and JavaScript.
2. Develop a web page based on Bootstrap.
3. Use MongoDB concepts in Web Application Development using React JS.
4. Create Single Page and multi-page Applications using React, Node JS, Express JS and MongoDB.
5. Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	3	1	1	-	-	-	1	1	1	1	3	-	3
CO 2	2	1	2	1	2	-	-	-	-	-	1	-	2	-	3
CO 3	2	1	2	2	1	-	-	-	-	-	-	-	3	-	3
CO 4	2	1	1	1	1	-	-	-	-	-	-	1	3	-	3
CO 5	2	1	1	2	2	-	-	-	-	-	-	2	2	-	3

List of Experiments:

(Note: Setup a Node JS server in Visual Studio to run the following experiments applications)

1. Build a basic static website using HTML5, CSS3 and bootstrap components.
2. Navigate to a particular element using DOM (Document Object Model) and modify it. Also understand the difference between A real DOM and Virtual DOM.
3. Explore the new features introduced in ES5 to recent.
4. Write React Class and functional Components and pass props.
5. Design a college admission enquiry form and store details in mongoDB using states and events as a React Functional Component.
6. Write code to illustrate the lifecycle of React JS.
7. Write code to understand different hooks in React JS.
8. Implement Routing in React JS.
9. Develop a CRUD Application using MERN.
10. Develop an Attendance Management Module for student attendance entry and Verifying attendance by students using MongoDB, Express JS, React JS and Node JS(MERN).

Textbooks:

1. Brad Dayley, Brendan Dayley, Caleb Dayley, “Node.js, MongoDB and React JS Web Development”, 2nd edition, Perason Education, 2018.
2. Alex Banks, Eve Porcello, “Learning React Modern Patterns for Developing React Apps”, 2nd Edition, Oreilly Media Inc, 2020.

Suggested Reading:

1. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node", second Edition, Apress Publications, 2019.

Online Resources:

1. https://github.com/eggheadio/illustrated-dev/blob/master/content/explainers/react-vdom/index.mdx
2. https://legacy.reactjs.org/docs/jsx-in-depth.html#props-default-to-true
3. https://react.dev/learn/tutorial-tic-tac-toe

22CSC13

DATA BASE SYSTEMS LAB

Instruction	3P Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Course Objectives:

This course aims to:

1. Become familiar with the features of MySQL / PostgreSQL / MongoDB /Oracle.
2. Explore ER tools for MongoDB
3. Understand about data storage techniques and indexing.

Course Outcomes:

Upon completion of this course, student will be able to:

1. Design database schema for an application using MYSQL
2. Write SQL queries for tasks of various complexities.
3. Create indices for query optimization.
4. Evaluate various database management systems
5. Design and develop applications to solve real time problems

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	2	3	-	-	-	-	-	-	1	2	2	3
CO 2	3	3	2	2	3	-	-	-	-	-	-	1	2	2	2
CO 3	3	2	2	1	3	-	-	-	-	-	-	-	3	3	2
CO 4	3	1	1	-	-	-	-	-	-	-	-	-	3	3	3
CO 5	3	1	-	1	-	-	-	-	-	-	-	-	3	3	2

List of Experiments:

1. Exploring the features of MySQL / PostgreSQL / MongoDB /Oracle
2. Tutorial on PostgreSQL / MySQL / SQLite in W3Schools or any other platform (2 Weeks)
3. Exercises on SQL queries for various tasks.(2-3 Weeks)
4. Practice interfacing with a database from a program using connectors like JDBC/ODBC
5. Small exercises on MongoDB
   a. Exercise in ER design for an application starting with natural language description
   b. Convert ER design to tables
6. Visualization of B+ tree using any simulation code
7. Sample Queries to explain the benefits of indexing.

Text Books

1. “Oracle: The complete Reference”, by Oracle Press.
2. Nilesh Shah, “Database Systems Using Oracle”, PHI, 2007.
3. Rick FVander Lans, “Introduction to SQL”, Fourth Edition, Pearson Education, 2007.

Suggested Reading:

1. "The Language of SQL (Learning)" by Larry Rockoff
2. MongoDB Fundamentals: A hands-on guide to using MongoDB and Atlas in the real world

Online Resources:

1. https://www.mongodb.com/docs/manual/tutorial/query-documents/
2. https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html