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

COMMITTED TO RESEARCH, INNOVATION AND EDUCATION 44 years

Scheme of Instruction and Syllabi

of

III and IV SEMESTERS

of

FOUR YEAR DEGREE COURSE

in

B.E. CSE (IoT, Cyber Security / Block Chain Technology)

(AICTE Model Curriculum with effect from AY 2022-23)

R-22 Regulation

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION

Model Curriculum (R-22)

B.E. CSE (IoT with Cyber Security including Block Chain Technology)

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	22CIC01	Fundamentals of Cyber Security and Tools	2	-	-	3	40	60	2
2	22CSC32	Discrete Mathematics	3	-	-	3	40	60	3
3	22CSC05	Data Structures	3	-	-	3	40	60	3
4	22CSC11	Data Base Management Systems	3	-	-	3	40	60	3
5	22CSC20	Computer Networks	3	-	-	3	40	60	3
6	22ITC01	Digital Logic and Computer Architecture	3	-	-	3	40	60	3
PRACTICAL									
7	22CIC02	Fundamentals of Cyber Security and Tools Lab	-	-	2	3	50	50	1
8	22CSC31	Data Structures Lab	-	-	2	3	50	50	1
9	22CSC33	Data Base Management Systems Lab	-	-	2	3	50	50	1
10	22CSC37	Computer Networks Lab	-	-	2	3	50	50	1
		TOTAL	**17**	**-**	**8**	**30**	**490**	**560**	**23**
11	22INT01	MOOCs / Training / Internship	-	-	**3-4 Weeks/ 90 Hours**	-	50	-	2
12	22ACT	Activity Points	-	-	-	-	-	-	-

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

22CIC01

FUNDAMENTALS OF CYBER SECURITY AND TOOLS

Instruction	2L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	2

Pre-requisites: Basic Computer Knowledge

Course Objectives: The objectives of this course are:

1. To Identify and present indicators that a cybercrime has occurred and understand methods and tools used in cybercrimes.
2. To collect, Process, Analyze and Present Computer Forensics Evidence.
3. To understand the legal perspectives and Organizational implications of Cyber Security.

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

1. Discuss different types of cybercrimes and analyze legal frameworks to deal with these cybercrimes.
2. Describe the usage of tools in cybercrimes.
3. Recognize the importance of digital evidence in prosecution.
4. Analyze and resolve cyber security issues in various domains.
5. Understand the importance of Cyber Laws and their Legal perspective.

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

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	2	1	-	-	1	1	-	-	2	-	1	-
CO 2	3	2	2	-	-	2	-	2	-	1	-	2	-	-	2
CO 3	2	2	1	-	-	-	-	-	-	2	1	2	1	-	2
CO 4	2	-	1	-	2	-	-	-	-	-	-	2	-	-	1
CO 5	1	-	1	-	-	-	-	-	-	-	-	2	-	1	-

UNIT - I

Introduction to Cyber Crime: Cyber Crime - Definition and Origins of the Word, Cyber-crime and Information Security, Layered approach architecture for Cyber Security, Classification of Cyber Crimes.

Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber café and Cybercrimes.

Botnets: The Fuel for Cybercrime, Attack Vector.

UNIT - II

Tools and Methods Used in Cybercrime: Introduction, Foot Printing Tools, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares TCP-dump, Wireshark.

Malware Analysis: Virus and Worms, Trojan Horse, Backdoors and Ransomware, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT - III

Understanding Cyber Forensics: Introduction, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Challenges in Computer Forensics.

UNIT – IV

Security: Windows Security at the heart of the defense, Attacks against the windows work station, the focus of UNIX/Linux Security, Web Browser Attacks and Operating Safely, E-Mail Security and Operating safely when using E-Mail, Introduction to Cloud Security, Web threats for Organizations,
Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

UNIT - V

Cyber Laws: The Legal Perspectives, Need of Cyber laws: the Indian Context, The Indian IT Act, Amendments of Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law.

Technology and Students: The Indian Scenario.

Text Books:

1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt.Ltd, 2011.
2. Dr. Eric Cole, Dr. Ronald Krutz and James W. Conley, "Network Security Bible", Edition 2, Wiley India Pvt.Ltd, 2010.
3. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw Hill, 2006.

Suggested Reading:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, "Cyber Security and Cyber Laws", Paperback, 2018.
2. Mark F Grady, Fransesco Parisi, "The Law and Economics of Cyber Security", Cambridge university press, 2006.

Online Resources:

1. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks
2. https://www.coursera.org/specializations/intro-cyber-security
3. https://www.coursera.org/learn/foundations-cybersecurity
4. https://onlinecourses.swayam2.ac.in/ugc19_hs25/preview

22CSC32

DISCRETE MATHEMATICS

Instruction	3L 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. 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, and relations 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	3	1	-	-	-	-	2	-	-	-	-	-
CO 2	3	3	1	3	-	-	-	-	-	-	-	1	-	-	-
CO 3	2	3	1	3	1	-	-	-	-	-	-	-	-	1	-
CO 4	3	3	2	3	1	-	-	-	-	-	-	1	-	1	1
CO 5	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-

UNIT – I

I**ntroduction 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**: Cartesian Products and Relations. Partial ordering relations, POSET, Hasse diagrams, Lattices as Partially Ordered Sets, Equivalence relations. Pigeon hole principle.

UNIT – III

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.

Trees: Definitions, Properties, Spanning Trees, Minimum Spanning trees: The Algorithms of Kruskal and Prims.

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. (2019). Discrete Mathematics and Its Applications. (8th Edition) ISBN10: 125967651X ISBN13: 9781259676512.
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. SBN: 9789382609407, 9789382609407, 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

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, students 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
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, Linear Probing, 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

22CSC11

DATA BASE MANAGEMENT SYSTEMS

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: 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 of database 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, students 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	2	2	3	-	-	-	-	-	-	1	-	1	-
CO 2	2	3	2	2	3	-	-	-	-	-	-	1	-	-	1
CO 3	2	1	2	1	3	-	-	-	-	-	-	-	-	1	1
CO 4	2	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO 5	2	1	-	1	-	-	-	-	-	-	-	-	-	1	-

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.
C**oncurrency 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. Indian Edition, 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

22CSC20

COMPUTER NETWORKS

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: Programming for problem solving and data structures.

Course Objectives:

This course aims to:

1. To understand the principles of data communication and organization of computer networks,
2. To analyze various routing protocols and congestion control algorithms.
3. To study the functions of the transport layer and to understand application layer protocols.

Course Outcomes:

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

1. Learn the communication protocol suites like ISO-OSI and TCP/IP.
2. Illustrate and explain Data Communications System and its components.
3. Identify and analyze various congestion control algorithms.
4. Distinguish the internet protocols and understand transport layer protocols like IP, ARP, ICMP, TCP, UDP, RTCP.
5. Identify various application layer protocols like HTTP, WWW, DNS, Email Protocols, FTP and the underlying protocols.

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

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	-	-	-	-	-	-	-	1	-	-	-
CO 2	2	2	2	2	-	-	-	-	-	-	-	1	-	-	-
CO 3	3	1	1	-	-	-	-	-	-	-	-	-	-	1	-
CO 4	2	1	-	-	-	-	-	-	-	-	-	-	-	-	1
CO 5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1

UNIT-I

Introduction: Data communication, network types and models, TCP/IP and OSI Protocol Suite, transmission media (wired and wireless), switching.

UNIT-II

Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, HDLC, multiple access protocols.

LAN: Wired LAN, wireless LAN, Virtual LAN.

UNIT-III

Network Layer: Network layer design issues, routing algorithms, congestion control algorithms, Quality of service, IPV4, IPV6, network layer protocols: ARP, RARP, ICMP, IGMP and DHCP.

UNIT-IV

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP, congestion control, quality of service.

UNIT-V

Application Layer: DNS, DDNS, SMTP, POP, IMAP, SSH, SFTP, WWW, HTTP, SNMP, Firewalls.

Text Books:

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw Hill, Fifth Edition, 2017.
2. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013.
3. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.

Suggested Reading:

1. Larry L. Peterson, Peter S. Davie, “Computer Networks”, Elsevier, Fifth Edition, 2012.
2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105081/
2. https://nptel.ac.in/courses/106/106/106106091/

22ITC01

DIGITAL LOGIC AND COMPUTER ARCHITECTURE

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To familiarize with logic gates, combinational and Sequential logic circuits.
2. To provide understanding of Digital Counters, registers and Data representation.
3. To present the operation of the Central Processing Unit.
4. To facilitate the techniques that computers use to communicate with input and output devices.
5. To introduce the concept of memory hierarchy and memory management.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply Boolean algebra for simplification and learn representation of data using numbers.
2. Understand fundamentals of combinational & sequential logic gates, registers and counters.
3. Infer the architecture and functionality of the central processing unit.
4. Explore the techniques that computers use to communicate with I/O devices for data transfer.
5. Comprehend memory hierarchy, cache memory and virtual memory.

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

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	1	-	1	-	-	-	1	-	-	1	-	-	-
CO 2	2	1	1	-	1	-	-	-	-	-	-	1	-	-	-
CO 3	2	2	1	-	-	-	-	-	-	-	2	2	-	-	-
CO 4	2	1	-	-	-	-	-	-	-	-	-	2	2	2	2
CO 5	2	2	1	-	-	-	1	-	1	-	2	2	-	-	-

UNIT–I

Data Representation: Number Systems, Octal and Hexadecimal Numbers, Decimal Representation, Complements: (r-1)'s Complement, r's Complement, Subtraction of Unsigned Numbers, Fixed–Point Representation, and Floating –Point Representation.

Digital Logic Circuits : Digital Computers, Logic Gates, Boolean Algebra, Map simplification, Product – of-sums Simplification, Don't –Care Conditions.

UNIT–II

Combinational Circuits: Decoders, Encoders, Multiplexers, Half-Adder, Full–Adders.

Flip-Flops: SR, D, JK, T Flip- Flops, Edge triggered Flip-Flops, Excitation Tables.

Registers: Register with Parallel load, Bidirectional Shift Register with Parallel load, 4-bit Synchronous Binary Counter.

UNIT–III

Central Processing Unit: General register Organization, Instruction Formats: Three Address Instructions, Two-Address Instructions, One-Address Instructions, and Zero-Address Instructions. Addressing Modes: Data Transfer and Manipulation, Program Control, Multi core Processors and their Performance.

UNIT–IV

Input-Output Organization: Peripheral Devices: ASCII Alphanumeric Characters, Input-output Interface: I/O Bus and Interface Modules, Asynchronous Data Transfer: Strobe Control, Handshaking, Asynchronous Communication Interface, First-In- First-Out Buffer, Modes of Transfer: Interrupt-Initiated I/O, Priority Interrupt: Daisy Chaining, Parallel Priority Interrupt, Priority Encoder, Direct Memory Access (DMA): DMA Controller.

UNIT–V

Memory Organization: Memory Hierarchy, Main Memory: RAM and ROM Chips, Memory Address Map, Memory Connection to CPU, Auxiliary memory: Magnetic Disks, Solid State Drive, Associative Memory: Hardware Organization, Read and Write Operations, Cache Memory: Associative Mapping, Direct Mapping, Set-Associative Mapping, Virtual Memory: Address Space and Memory Space, Address Mapping using Pages, Associative Memory Page Table.

Text Book:

1. M. Morris Mano, "Computer System Architecture", 3rd Edition, Pearson Education. 2016.

Suggested Reading:

1 Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL design", 2nd Edition, McGraw Hill, 2009.
2 ZVI Kohavi, "Switching and Finite Automata Theory", 2nd Edition, Tata McGraw Hill, 1995.
3 William Stallings, "Computer Organization and Architecture", 8th Edition, PHI.2010.
4 Carl Hamachar, Vranesic, Zaky, "Computer Organization", 5th Edition, McGraw Hill.2002.

Web Resources:

1. https://nptel.ac.in/courses/117106114Week1%20Slides1.1Introduction.pdf
2. https://ece.gmu.edu/coursewebpages/ECE/ECE545/F10/viewgraphs/ECE545_lecture1_digital_logic_review.ppt
3. http://www.nptelvideos.in/2012/11/computer-organization.html

22CIC02

FUNDAMENTALS OF CYBER SECURITY AND TOOLS LAB

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

Pre-requisites: Basic Computer Knowledge

Course Objectives: The objectives of this course are

1. To understand the tools used in Cyber Crimes.
2. To understand the phases involved in planning Cyber Crimes.
3. To configure Defense Security System.

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

1. Use Foot Printing Tools for Information Gathering.
2. Scan and scrutinize the information gathered.
3. Understand the usage of Sniffer Tools.
4. Become familiar with Attack Launching Tools.
5. Configure the proactive defense system.

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

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	-	2	3	1	-	1	3	3	-	2	3	3	1
CO 2	2	3	1	3	3	1	-	1	2	2	1	2	3	3	1
CO 3	2	2	2	3	3	1	-	1	2	2	1	2	3	3	1
CO 4	2	2	2	3	3	2	-	1	2	2	-	2	3	3	1
CO 5	2	3	3	2	2	2	-	1	1	1	1	2	3	3	1

List of Experiments:

1. Explore Information Gathering Tools (Foot Printing – Network Foot Printing, Website Foot Printing, DNS Footprinting, Social Network Footprinting, Email Footprinting).
2. Explore the tools for Scanning and Scrutinizing the gathered information. (IP Scanner, Port Scanner, Vulnerability Scanner, Web Application Scanner).
3. Introduction to Password Hacking Tools.
4. Analysis of Keylogger Software.
5. Introduction to Malware tools. (Virus dissemination tools, Trojans).
6. Introduction to Phishing & Sniffer Tools.
7. Study and Exploration of Different Attack Launching Tools. (DoS Attacks).
8. Study of Ransomware.

Text Books:

1. Sunit Belpre and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Pvt. Ltd, 2011.
2. Zoom, “Cyber Security Professional Lab Manual”.
3. Dr. Eric Cole, Dr. Ronald Krutz and James W. Conley, “Network Security Bible”, Edition 2, Wiley India Pvt. Ltd, 2010.

Online Resources:

1. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks
2. https://www.coursera.org/specializations/intro-cyber-security
3. https://www.coursera.org/learn/foundations-cybersecurity
4. https://onlinecourses.swayam2.ac.in/ugc19_hs25/preview

22CSC31

DATA STRUCTURES LAB

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

Pre-requisites: Any Programming Language.

Course Objectives:

This course aims to:

1. Understand the basic concepts of data structures and abstract data types.
2. Explore 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. Evaluate various sorting techniques.
4. Analyze various algorithms of linear and nonlinear data structures.
5. Choose or create appropriate data structures to solve real world problems.

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

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	2	3	1	-	-	-	-	-	-	-	-	-	-	1	1

List of Experiments

1. Implementation of Quick sort, Merge sort and Selection sort.
2. Implementing Stack using array.
3. Conversion of Infix expression to Postfix expression.
4. Implement the algorithm for Evaluation of Postfix.
5. Implementing Queues using array.
6. Implementation of Insert, Delete and Display operations on Single Linked List.
7. Implementation of Stack and Queue using linked list.
8. Implementation of Insert, Delete and Display operations on doubly Linked List.
9. Implementation of Binary Search Tree operations.
10. Implementation of Heap Sort.

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.

22CSC33

DATA BASE MANAGEMENT SYSTEMS LAB

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. Become familiar with the concepts of structured query language.
2. Understand about programming language / structured query language (PL/SQL).
3. Become familiar with generation of form and open database connectivity.
4. Add constraints on Databases implement DCL, TCL and advanced SQL commands.
5. Develop programs using cursors, triggers, exceptions, procedures and functions in PL/SQL.

Course Outcomes:

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

1. Outline the built-in functions of SQL and apply these functions to write simple and complex queries using SQL operators.
2. Demonstrate Queries to Retrieve and Change Data using Select, Insert, Delete and Update. Construct Queries using Group By, Order By and Having Clauses.
3. Demonstrate Commit, Rollback, Save point commands, SQL Plus Reports and formulate the Queries for Creating, Dropping and Altering Tables, Views, constraints.
4. Develop queries using Joins, Sub-Queries and Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update, Creating Password and Security features.
5. Develop PL/SQL code using Cursors, Exception, Composite Data Types and Procedures, Functions and Packages.

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

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	2	3	-	-	-	2	-	1	3	1	1	2
CO 2	3	3	2	3	3	-	-	-	2	-	1	3	1	1	2
CO 3	3	2	2	2	3	-	-	-	2	-	1	1	1	1	2
CO 4	3	1	1	1	-	-	-	-	2	-	1	-	1	1	2
CO 5	3	1	-	1	-	-	-	-	1	-	1	-	1	1	2

List of Experiments:

SQL:

1. Queries using Built-In functions, like aggregate functions, String Functions, Numeric Functions, Data Functions, Conversion Functions and other miscellaneous.
2. Queries using operators in SQL.
3. Queries to Retrieve and Change Data: Select Insert, Delete and Update.
4. Queries using Group By, Order By and Having Clauses.
5. Queries on Controlling Data: Commit, Rollback and Save point.
6. Queries to Build Report in SQL *PLUS.
7. Queries for Creating, Dropping and Altering Tables, Views and Constraints.
8. Queries on Joins and Correlated Sub-Queries.

9. Queries on Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update.
10. Creating Password and Security features.
11. Querying in NoSql.

PL/SQL:

1. Write a PL/SQL code using Basic Variable, Anchored Declarations and Usage of Assignment Operation.
2. Write a PL/SQL code Bind and Substitution Variables, Printing in PL/SQL.
3. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
4. Write a PL/SQL code using Cursors, Exception and Composite Data Types.
5. Write a PL/SQL code using Procedures, Functions and Packages.

Note: The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

Text Books / Suggested Reading:

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

22CSC37

NETWORKS LAB

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

Pre-requisites: Operating Systems, Data Communication and Computer Networks.

Course Objectives:

This course aims to:

1. To familiarize students with the communication media, devices, and protocols.
2. To expose students to gain practical knowledge of computer networks and its configuration.
3. To create simple network topologies using simulation tools.

Course Outcomes:

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

1. Identify the different types of wiring equipment used in the network lab.
2. Understand the various network devices like repeater, hub, switch, and routers.
3. Practice the basic network configuration commands like ifconfig, ping, traceroute, nslookup, dig, arp, netstat, nmap.
4. Design the network topologies using GNS3 and examine the packet transfer.
5. Design the network using various routing protocols.

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

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	-	-	-	-	-	-	-	1	2	2	2
CO 2	3	3	2	2	-	-	-	-	-	-	-	1	2	2	1
CO 3	3	1	1	-	-	-	-	-	-	-	-	-	1	1	-
CO 4	2	1	-	-	-	-	-	-	-	-	-	-	3	3	2
CO5	1	1	-	-	-	-	-	-	-	-	-	-	1	1	2

List of Experiments:

1. Study of Network media, cables, and devices and Cable Construction.
2. Demonstration of basic network commands/utilities (both in Windows and Linux).
3. PC Network Configuration.
4. Building a switch-based network / Configuration of Cisco Switch CBS250-24T-4G 24-Port.
5. Configuration of Cisco Router ISR-4331.
6. Configuration of VLAN in Cisco switch.
7. Develop different local area networks using GNS3. Connect two or more Local area networks. Explore various sub-netting options.
8. Configure Static routing using GNS3 tool.
9. Basic OSPF configuration using GNS3 tool.
10. Basic EIGRP Configuration using GNS3 tool.

Text Books:

1. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013.

Online Resources:

1. https://learningnetwork.cisco.com/s/question/0D53i00000Kt7EkCAJ/tools-for-ccnp-network-simulator-lab-tasks
2. https://www.packettracernetwork.com/
3. https://www.ghacks.net/2019/11/13/gns3-is-an-open-source-graphical-network-simulator-for-windows-linux-and- macos/
4. https://www.imedita.com/blog/top-10-list-of-network-simulation-tools/
5. https://www.gns3.com/

22INT01

INTERNSHIP-I
(MOOCs/Training/Internship)

Instruction	90 hours
Continuous Internal Evaluation	50 Marks
Credits	2

Course Objectives:

This course aims to:

1. Expose the students to the industrial environment and technologies.
2. Provide possible opportunities to learn, make them 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	3	2	2	1	1	3	2	3	3	3	3	3
CO 2	2	2	2	1	1	2	2	1	3	2	3	3	3	3	3
CO 3	3	2	1	1	1	2	2	1	2	2	3	3	3	3	3
CO 4	2	3	3	3	1	2	1	-	3	3	3	3	3	3	3
CO 5	1	1	1	1	1	1	-	-	2	3	3	3	1	1	3

Process to be followed for carrying out Internship. 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 (A)

SCHEME OF INSTRUCTION AND EXAMINATION

Model Curriculum (R-22)

B.E. CSE (IoT with Cyber Security including Block Chain Technology)

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	22CIC03	AI Tools, Techniques and Applications	2	1	-	3	40	60	3
2	22CSC14	Design and Analysis of Algorithms	3	-	-	3	40	60	3
3	22ITC17	Web Technologies	3	-	-	3	40	60	3
4	22MTC13	Mathematical Foundation for Data & Security	3	-	-	3	40	60	3
5	22ECC36	Basic Electronics and Sensors	3	-	-	3	40	60	3
6	22MBC01	Engineering Economics &Accountancy	3	-	-	3	40	60	3
PRACTICAL									
7	22CIC04	AI Tools, Techniques and Applications Lab	-	-	2	3	50	50	1
8	22CSC34	Design and Analysis of Algorithms Lab	-	-	2	3	50	50	1
9	22ITC18	Web Technologies Lab	-	-	2	3	50	50	1
10	22ECC37	Basic Electronics and Sensors Lab	-	-	2	3	50	50	1
		TOTAL	**17**	**1**	**8**	**30**	**440**	**560**	**22**
11	22ACT	Activity Points	-	-	-	-	-	-	-

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

22CIC03

AI TOOLS, TECHNIQUES AND APPLICATIONS

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

Prerequisite: Basic understanding of computer fundamentals

Course Objectives: The objectives of this course are to:

1. Introduce fundamental concepts of AI.
2. Demonstrate the capabilities of AI applications.
3. Present various modeling and formulation techniques to solve problems using AI.
4. Introduce state-of-art tools and techniques.

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

1. Understand fundamental concepts of AI and its importance.
2. Identify various Machine Learning algorithms and their limitations.
3. Develop Chatbots based on requirements.
4. Analyze complex problems involving image processing, Computer Vision and HCI.
5. Understand smart solutions for various domains.

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

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO 2	2	2	-	-	-	-	-	-	-	-	-	-	-	1	1
CO 3	-	-	2	-	-	-	-	-	-	-	-	-	1	3	1
CO 4	-	-	2	3	2	-	-	-	-	-	-	-	-	1	2
CO 5	2	2	2	-	-	-	1	-	-	-	-	-	2	2	3

UNIT-I:

Introduction to Artificial Intelligence: Definition, importance of AI, application areas, state – of – the art in AI, overview of hard AI problems and challenges facing in the field of AI;

Machine Learning: Introduction, machine learning algorithms, machine learning in practice, testing, problems with machine learning, dangers of machine learning and benefits.

UNIT-II:

Natural Language Processing: Overview of NLP and components, applications, use cases of NLP and challenges.

Computer Vision: capabilities of computer vision, use of computer vision, computer vision on mobile devices, best practices and use cases, challenges.

UNIT – III

Building AI and Machine Learning Projects: Workflow of a ML project, data science project, data collection, data set preparation.

AI Technologies, Tools, Platforms: Tensor Flow, Scikit, PyTorch, Keras, Rapid Miner, AWS, Google Cloud AI, Azure, IBM Watson.

UNIT – IV

Chatbots: Introduction to chatbots, architecture of a chatbot, process build Chatbots, challenges in building successful Chatbots, best practices, industry case studies, Virtual assistants.

UNIT – V

Applications and Impact of AI: Smart applications, Current challenges, trends, opportunities, scalability, adversarial attacks on AI, adverse uses of AI, impact of AI on world's economy and its social implications.

AI Tools and Applications: Scikit-Learn, Tensor-Flow comparison and real applications.

Text Books:

1. Tom Markiewicz & Josh Zheng, "Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications" O'Reilly, 2017.
2. Stuart J. Russell and Peter Norvig, "Artificial Intelligence A Modern Approach".

Suggested Reading:

1. Aurélien Géron, "Hands on Machine Learning with Scikit-Learn and Tensor Flow [Concepts, Tools, and Techniques to Build Intelligent Systems]", Published by O'Reilly Media,2017
2. Joseph Howse, Prateek Joshi, Michael Beyeler - Opencv_ Computer Vision Projects with Python-PacktPublishing (2016)

Online Resources:

1. https://medium.com/@salisuwy/build-an-ai-assistant-with-wolfram-alpha-and-wikipedia-in-python- d9bc8ac838fe
2. https://www.coursera.org/learn/uol-machine-learning-for-all
3. https://www.coursera.org/learn/uol-machine-learning-for-all#syllabus
4. http://aws.amazon.com 2.http://code.google.com/appsengine
5. http://scikit-learn.org/stable
6. https://opencv.org/
7. https://github.com/qqwweee/keras-yolo3
8. https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/

22CSC14

DESIGN AND ANALYSIS OF ALGORITHMS

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: Basics of Data structures and algorithms.

Course Objectives:
This course aims to:
1. Provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. Introduce the different algorithmic approaches for problem solving through numerous example problems.
3. Provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Analyzing performance of algorithms using asymptotic notations.
2. Demonstrate familiarity with major algorithms and importance of algorithm design techniques.
3. Apply algorithm design techniques on different problems.
4. Analyze the efficiency of the algorithms.
5. Understanding limits of efficient computation with the help of complexity classes.

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

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	1	-	-	-	-	-	-	-	1	1
CO 2	3	3	2	-	1	-	-	-	1	-	1	1	1	2	1
CO 3	3	2	2	2	2	-	-	-	1	-	1	-	1	2	1
CO 4	3	3	2	2	2	-	1	-	1	-	-	-	-	2	1
CO 5	3	2	2	2	2	1	1	-	1	-	-	-	1	1	1

UNIT-I
Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds– best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs.
Divide and Conquer: The general method.
Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem, Randomized Quicksort.

UNIT-II
Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job Scheduling with Deadlines.
Dynamic Programming: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix Chain Multiplication, Longest Common Subsequence, Optimal Binary Search Tree.

UNIT-III

Backtracking: The general Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycle.

Branch-and- Bound: The general method, FIFO Branch and Bound, LC Branch and Bound, 0/1 Knapsack Problem, Travelling Salesperson problem.

UNIT-IV

Graph Algorithms: Applications of DFS: Bi-Connected components, Strongly Connected Components, Topological Sorting.

Shortest Path Algorithms: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms.

Minimum Spanning Tree Algorithms: Prims and Kruskal.

UNIT-V

Theory of NP-Completeness: Polynomial Time, Polynomial Time Verification, P, NP, NP-Hard and NP-Complete Classes, NP-Completeness and Reducibility.

Standard NP-Complete Problems and Reduction Techniques: The Clique Problem, Vertex-Cover and Subset Sum Problem.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms",MIT Press/McGraw-Hill, 3rd Edition, 2009.
2. E. Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2008.

Suggested Reading:

1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis", and InternetExamples, Wiley Second Edition.

Online Resources:

1. https://nptel.ac.in/courses/106101060/

22ITC17

WEB TECHNOLOGIES

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

s

Course Objectives:

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

Course Outcomes:

Upon successful completion of this course, students 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	3	1	1	-	-	-	1	1	1	1	1	2	1
CO 2	2	1	2	1	2	-	-	-	-	-	1	-	1	2	1
CO 3	2	1	2	2	1	-	-	-	-	-	-	-	1	1	1
CO 4	2	1	1	1	1	-	-	-	-	-	-	1	1	2	2
CO 5	2	1	1	1	1	-	-	-	-	-	-	1	1	2	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.

UNIT-III

Mongo DB: Introduction, Importance of NoSQL databases, Data types, Documents, nested Documents, CRUD Operations.

Basic cursor methods: map, toArray, pretty, forEach, limit, count, sort, Columnar Databases, Indexing and Aggregation, MongoDB Node JS Drivers and CAP theorem.

UNIT-IV

React Js: 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

Node JS: Creating Web Server, Functions, Buffer, Node Modules, Creating Web Server, Handling HTTP requests.

Express JS: 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.

Web 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

22MTC13

Mathematical Foundation for Data & Security

Instruction	3 L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. To know the characteristic of various continuous probability distributions.
4. To discuss the testing of hypothesis of sample data.
5. To know the security issues of Cryptography.

Course outcomes: On successful completion of this course the students shall be able to

1. Analyze the coefficient of skewness and fitting of the data by various methods.
2. Apply properties of Mathematical Expectations and analyze the various distributions.
3. Evaluate areas of curves by using various distributions.
4. Apply various tests for testing the significance of sample data.
5. Apply RSA –PKC for solving security issues.

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

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO 2	2	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO 3	2	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO 4	2	2	1	-	-	-	-	-	-	-	-	1	1	1	1
CO 5	2	2	1	-	-	-	-	-	-	-	-	1	3	2	3

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: Mathematical Expectation and Discrete Probability 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. Poisson distribution, MGF and Cumulates of the Poisson distribution, Recurrence formula for the probabilities of Poisson distribution (Fitting of Poisson distribution)

UNIT-III: Continuous Probability Distributions

Normal distribution, Characteristics of normal distribution and Normal probability Curve, MGF and CGF of Normal distribution, Areas under normal curve. Uniform distribution, Moment generating function, Mean and Variance of uniform distribution. Exponential distribution, MGF, CGF, Mean and Variance of Exponential distribution.

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 of Goodness of fit.

UNIT-V: Number Theory & CRYPTOGRAPHY (RSA – PKC)

Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Wilson's Theorem, Euler's Phi-Function, Euler's Theorem, Some Properties of the Phi-Function. The RSA public key cryptosystem, Implementation and security issues, Pollard's p−1 factorization algorithm, Quadratic Residues and quadratic reciprocity.

Text books:

1. S.C.Gupta, V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. Burton, David M. (2007) "Elementary Number Theory" (7thedu.). Tata McGraw Hill Edition, Indian Reprint
3. "Mathematical Cryptography" by Jeffrey Hoffstein, Jill Pipher, Joseph H. Silverman Springer Science+ Business Media LLC.

Suggested Reading:

1. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, 3rd Ed., Wiley, 1968.
2. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.
3. Koshy T."Elementary Number Theory with Applications", Elsevier Publications, New Delhi, 2002.
4. G.A.Jones & J.M.Jones "Elementary Number Theory", Springer UTM, 2007.

22ECC36

BASIC ELECTRONICS AND SENSORS

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

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	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. Analyze 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	1	1	1	3	3	2	1	2	1	1	-
CO 2	3	3	3	1	1	1	1	2	3	2	2	2	2	2	1
CO 3	3	2	2	1	2	2	2	1	3	2	2	2	2	3	3
CO 4	3	3	3	3	1	2	2	2	3	2	2	2	3	3	3
CO 5	3	3	3	2	1	2	2	2	3	2	2	2	3	3	3

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**,** Tacho generator 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.

22MBC01

ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

This course aims to:

1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes:

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

1. Apply fundamental knowledge of Managerial Economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand Production and Cost relationships to make best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

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

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	1	3	1	1	1	1	1	1	1	-	-	-	-	-
CO 2	2	2	2	2	-	1	1	1	-	1	-	1	-	-	-
CO 3	1	2	1	2	2	-	2	1	-	1	-	-	-	-	1
CO 4	2	2	1	2	2	1	1	3	-	1	-	-	-	1	2
CO 5	1	3	1	2	1	1	2	-	-	1	2	1	-	-	2

UNIT-I

Introduction to Managerial Economics: Introduction to Economics and its evolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

UNIT-II

Demand and Supply Analysis: Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

UNIT-III

Production and Cost Analysis: Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns.

Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features of Perfect Competition, Price Output Determination under Perfect Competition, Features of Monopoly Competition, Price Output Determination under Monopoly Competition Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

Unit-IV

Accountancy: Book-keeping, Principles and Significance of Double Entry Bookkeeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments.

Unit-V Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

Text Books:

1. Mehta P.L. "Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's Educational publishers, 2016.
2. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 12th Edition, 2018.

Suggested Readings:

1. Panday I.M. "Financial Management", 11th edition, Vikas Publishing House, 2016.
2. Varshney and K L Maheswari, "Managerial Economics", Sultan Chand, 2014.
3. M. Kasi Reddy and S. Saraswathi, "Managerial Economics and Financial Accounting", Prentice Hall of India Pvt Ltd, 2007.
4. A. R. Aryasri, "Managerial Economics and Financial Analysis", McGraw-Hill, 2018.

22CIC04

AI TOOLS, TECHNIQUES AND APPLICATIONS LAB

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: The main objectives of this course are to:

1. Expose the students to AI related real world problems.
2. Familiarize students with AI tools and techniques.
3. Expose students with AI technologies and platforms.

Course Outcomes: At the end of the course, students shall be able to

1. Demonstrate the capabilities of AI.
2. Build models for various real time problems using AI/ML Tools.
3. Develop Chatbots, programs for simple applications.
4. Analyze and interpret the experimentation results.
5. Develop skills to communicate the experimentation results.

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

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO 2	2	2	2	2	-	-	-	-	-	-	-	-	-	1	1
CO 3	-	-	2	-	-	-	-	-	-	-	-	-	-	2	1
CO 4	-	2	2	3	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-

Lab Experiments:

1. Overview of AI, AI/ML project life cycle
2. Design/construct the workflow of a general AI project using draw.io
3. Train a ML model to recognize a Person or Object including gestures
4. Train a ML model to recognize various sound bytes and speech
5. Develop an app to recognize objects using image classification
6. Develop an Expression Match app using the trained ML model for facial expressions
7. Develop a Voice Authentication app tat uses a trained audio model of the user using audio classification to recognize the user's voice to authentication
8. Develop a conversational chatbot to automatically recognize speech, understand the intent of the user and generate a response accordingly using Amazon Lex
9. Design a program using Wolfram Language to classify Data (Numbers, Images, Colors) using automatic model selection
10. Design a program using the Wolfram Language to demonstrate Vector Encoding based Feature Extraction and Clustering for a dog image dataset

Text Books:

1. Tom Markiewicz & Josh Zheng, "Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications" O'Reilly, 2017

Online Resources:

1. https://teachablemachine.withgoogle.com/v1/
2. https://appinventor.mit.edu/
3. https://aws.amazon.com/lex/
4. https://www.wolfram.com/
5. https://www.coursera.org/

22CSC34

DESIGN AND ANALYSIS OF ALGORITHMS LAB

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

Pre-requisites: Programming and Problem Solving, Basics of Data structures and algorithms lab and Object Oriented Programming.

Course Objectives:

This course aims to:

1. Design and construct simple programs by using the different design strategies for solving different problems.
2. To enhance programming skills while improving their practical knowledge in implementing the algorithms.
3. To strengthen the practical ability and to apply suitable algorithmic approaches for solving real time problems.

Course Outcomes:

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

1. Implement greedy, dynamic programming, backtracking and branch and bound techniques.
2. Demonstrate various algorithmic design techniques.
3. Analyze the performance of various algorithms.
4. Compare various design strategies.
5. Formulate solutions to solve real world problems use acquired knowledge.

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

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	2	1	-	-	-	-	1	-	1	1	1
CO 2	3	2	-	1	1	1	-	-	1	-	2	-	-	-	-
CO 3	3	3	2	2	1	2	-	-	1	-	1	-	-	1	1
CO 4	3	1	1	2	-	1	-	-	-	-	1	-	-	1	1
CO 5	3	3	2	2	2	2	1	-	1	-	2	-	1	2	2

The following task should be carried out by the students in the laboratory for each experiment:

1. Setup the environment for the experiment.
2. Select appropriate design technique to implement the problem.
3. Represent the solution using algorithm.
4. Analyze the performance of the algorithm (Time and Space complexity).
5. Justify the performance of your solution is better than other strategies.

List of Experiments:

1. You are given the task of choosing the optimal path to connect 'N' devices. The devices are connected withthe minimum required N-1 wires into a tree structure, and each device is connected with the other with a wire of length 'L' i.e 'D_1'connected to 'D_2' with a wire of length 'L_1'. This information will be availableforall 'N' devices.

a) Determine the minimum length of the wire which consists of N-1 wires that will connect all devices.
b) Determine the minimum length of the wire which connects D_i to all other devices where $1 \leq i \leq N$.

2. CSE department of CBIT want to generate a time table for 'N' subjects. The following information is given- subject name, subject code and list of subjects code which clashes with this subject. The problem is to identify the list of subjects which can be scheduled on the same time line such that clashes among them do not exist.
3. A Test has 'N' questions with a heterogeneous distribution of points. The test-taker has a choice as to which questions can be answered. Each question Q_i has points P_i and time T_i to answer the question, where $1 \leq i \leq N$. The students are asked to answer the possible subsets of problems whose total point values add up to a maximum score within the time limit 'T'. Determine which subset of questions gives student the highest possible score.
4. Given N items with their corresponding weights and values, and a package of capacity C, choose either the entire item or fractional part of the item among these N unique items to fill the package such that the package has maximum value.
5. Given a bunch of projects, where every project has a deadline and associated profit if the project is finished before the deadline. It is also given that every project takes one month duration, so the minimum possible deadline for any project is 1 month. In what way the total profits can be maximized if only one project can be scheduled at a time.
6. N-Queen is the problem of placing 'N' chess queens on an N×N chessboard. Design a solution for this problem so that no two queens attack each other.
   Note: A queen can attack when an opponent is on the same row, column or diagonal.
7. Bi-connected graphs are used in the design of power grid networks. Consider the nodes as cities and the edges as electrical connections between them, you would like the network to be robust and a failure at one city should not result in a loss of power in other cities.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms",3rd Edition, MIT Press/McGraw-Hill, 2009.
2. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis, and Internet Examples", Second Edition, Wiley, 2001.

22ITC18

WEB TECHNOLOGIES LAB

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:

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

1. Build interactive and user-friendly static front end 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	3	1	1	-	-	-	1	1	1	1	-	1	1
CO 2	2	1	2	1	2	-	-	-	-	-	1	-	-	1	1
CO 3	2	1	2	2	1	-	-	-	-	-	-	-	-	1	1
CO 4	2	1	1	1	1	-	-	-	-	-	-	-	1	1	1
CO 5	2	1	1	2	2	-	-	-	-	-	-	-	1	2	2

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

List of Experiments:

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).

Text Books:

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.

Web References:

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

22ECC37

BASIC ELECTRONICS AND SENSORS LAB

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

Instruction	2P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	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 Robots 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	2	1
CO 5	1	2	3	3	3	2	3	3	3	2	3	2	1	1	2

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 have 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. Paul B. Zbar, "Industrial Electronics, a Text-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.