HYDERABAD INSTITUTE OF TECHNOLOGY AND MANAGEMENT
B.TECH. HR-21 COURSE STRUCTURE
CSE-INTERNET OF THINGS
(Applicable for the batch admitted from 2021-22 onwards)

### III – Semester (II – Year)

<table>
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**Non-Credit Courses**

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MATHEMATICAL AND STATISTICAL FOUNDATION
(Common to CSC/ CSD/CSM/CSO)

Pre-requisite: Basic knowledge of set and relations theory, permutations, combinations, Venn diagrams, mean, median, mode and testing of hypothesis of different samples.

Course Objectives: To provide the student with
Different random variables and various probability distribution functions.
• The discrete and continuous of the Bernoulli, binomial, Poisson and the Normal distributions.
• Measures of Central tendency and curve fitting by the method of least squares.
• Concept of point and interval estimations and concept of test of hypothesis and test of significance.
• How to apply the five-step test procedure for test of hypothesis concerning a population mean when the sample size is small.

MODULE I
Unit 1: PROBABILITY

Unit 2: RANDOM VARIABLES

MODULE II
Unit 1: DISCRETE DISTRIBUTIONS
Uniform, Binomial and, Poisson distribution and statistical constants of these distributions using moment generating function

Unit 2: CONTINUOUS DISTRIBUTIONS
Uniform Distribution, Exponential Distribution, Normal Distribution and statistical constants of these distributions using moment generating function

MODULE III
Unit 1: BIVARIATE DISTRIBUTION
Joint Probability distributions - Joint Probability mass function, joint probability density function, Marginal Distribution, Covariance of two random variables.

Unit 2: CORRELATION and REGRESSION
Karl Pearson coefficient of correlation, Rank correlation, Regression coefficient, Lines of regression.
MODULE IV
Unit 1: SAMPLING DISTRIBUTION:
Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means, variance and the Central Limit Theorem.

Unit 2: ESTIMATION:
Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Estimating a Proportion for single mean, Difference between Two Means, between Two Proportions for Two Samples

MODULE V
Unit 1: GREATEST COMMON DIVISORS AND PRIME FACTORIZATION:
Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers

Unit 2: CONGRUENCES:
Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences.

Text Books:

Reference Books:

MOOC courses:
1. Probability: http://nptel.ac.in/courses/111105041/
2. Probability and Statistics: http://nptel.ac.in/courses/111105035/
3. Probability: https://nptel.ac.in/courses/111/102/111102111/

E- Books:
**Course Outcomes:** After learning the contents of this paper the student must be able to

CO1: Solve the probability and the probability distribution function of random variables.
CO2: Evaluate random processes which occur in engineering applications governed by the Binomial, Poisson, Normal and Exponential distributions.
CO3: Apply Inferential Statistics to make predictions or judgments about the population from which the sample data is drawn.
CO4: Apply the number theory concepts to cryptography.

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FUNDAMENTALS OF IOT

PREREQUISITE: Basics of computers

COURSE OBJECTIVE:
1. The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time.
2. The course enables student to understand the basics of Internet of things and protocols.
3. Introduces some of the application areas where Internet of Things can be applied.
4. Students will learn about the middleware for Internet of Things. To understand the concepts of Web of Things

COURSE OUTCOMES:
1. Interpret the concepts of IoT
2. Analyze the importance of Protocols in IoT
3. Understand the IoT architecture
4. Apply IoT concepts in Industry applications and IoT platforms

Module 1:
Introduction to IOT - IoT and its importance, Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications
Overview of Governance, Privacy and Security Issues.

Module II

Module III
IOT ARCHITECTURE - IoT Open-source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models
IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.

Module IV
WEB OF THINGS - Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT
Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.

Module V:
IOT APPLICATIONS – Qualitative study of sensors, IoT applications for industry: Future Factory Concepts, Smart Objects, Smart Applications.
Study of existing IoT platforms /middleware, IoT- A, Hydra etc.
TEXT & REFERENCES:

Text:

References:

<table>
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English For Employability
(Common to CSE/EEE/ECE/CSM/CSD/CSC/CSO/MECH)

Course Objective:
1. To introduce growing need of English Language Skills for Employability (ELSE).
2. To help the students understand the importance of inter-personal communication, team dynamics and role behaviour at the work place
3. To enhance their Behavioural skill and Entrepreneurship skills.

Module I - Wings of Fire
Unit 1: “Orientation” an excerpt from Wings of fire-An Autobiography of Abdul Kalam by Arun Tiwari.
Unit 2: Grammar
Vocabulary- Omission of Articles, Collective Nouns, Prepositions, Collocations.
Reading- Observation Passage, Survey Passage
Writing- Comprehension Passages based on graphs, charts & other illustrations.

Module II 5 Points Someone
Unit 1: The Gift an excerpt from 5 Points Someone by Chetan Bhagat
Unit 2: Grammar -
Vocabulary- Advanced Collocations, Proverbs, Idioms, One word Substitute
Reading – Complex passage, Reading Comparison,
Writing- Usage of Idioms and Proverbs in Passage

Module III – Wise Leaders Wanted & Shift Your Perspective: Connect to Your Noble Purpose
Unit 1: “Wise Leaders Wanted & Shift Your Perspective: Connect to Your Noble Purpose” an excerpt from From Smart to Wise: Acting and Leading with Wisdom Kaipa, Prasad, and Navi Radjou.
Unit 2: Grammar
Vocabulary- Technical vocabulary, Auxiliaries and Modals,
Reading- Technical Comprehension,
Writing- Creative Resume.

Module IV- Variation Under Nature
Unit 1: “Variation Under Nature” an excerpt from Origin of Species by Charles Darwin
Unit 2: Grammar
Vocabulary- Coherence-Cohesive devices, Figures of speech
Reading- Inferring Reading, Survey, Question, Read, Recite and Review (SQ3R)

Module V- Let's Build a Company: A Start-up Story Minus the Bullshit
Unit 1: Let's Build a Company: A Start-up Story Minus the Bullshit by Harpreet Grover and Vibhore Goyal
Unit 2: Grammar

Vocabulary - Topic/Situation based Vocabulary, Tongue Twisters.

Reading - Critical Reading of known/unknown passages

Writing - Common Errors in Tenses, Description of hobbies, Future plans, Reported Speech: Direct & Indirect Speech, Email Writing, Formal letter writing (Enquiry, Apology, Leave, Request) Notice Writing, Information Transfer, Technical report writing

Textbooks

References
5. Murphy, R. Intermediate English Grammar.

Course Outcomes: After undergoing this course, the student will be able to;

CO1: Understand the concept and process of employability skills.
CO2: Demonstrate the employability skills in both verbal and non-verbal communications.
CO3: Apply skill identification strategies to bring out the results on social and industry demands.
CO4: Recognize right professional, Entrepreneurship skills and social ethical values.

<table>
<thead>
<tr>
<th>CO-PO Mapping Chart</th>
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<tr>
<td>3/2/1 indicates strength of correlation</td>
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DATASTRUCTURES

Prerequisite: Knowledge of C Programming

Course Objectives:
1: To make student knowledgeable in data structure concepts
2: To make students apply the data structure concepts in relevant applications
3: To make students apply the graph techniques in relevant applications
4: To make students determine the best sorting technique to process the data

Course Outcomes:
At the end of the course the students will be able to:
1: Identify the concepts of data structures in relevant applications
2: Apply the concept of data structures for the new situations
3: Apply the graph traversal techniques to solve map related problems
4: Analyze the best sorting technique pertaining to the area applied

Module 1:
Algorithm Analysis: Asymptotic analysis, simple justification techniques, Recursion, Illustrative examples, Analyzing Recursive algorithms, Designing Recursive algorithms.

Module 2:

Module 3:
Linked Lists – Singly Linked List, Implementation using arrays, Implementation using Queues, Circular Linked List- Doubly linked list- Implementation of doubly linked list, implementation using De queue.
Trees- General trees, Binary trees, Implementation using array and linked representation, tree traversals- in order, preorder, post order, Breadth-first traversal, Implementation, Application of tree traversals.

Module 4:
Priority Queue-ADT, Implementation, Heap, sorting with a priority Queue, Adaptable priority Queues Hash Tables and Skip Lists-Maps and Dictionaries, Hash tables, Sorted Maps, Skip lists, Sets, Multi sets and Multi maps
Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Traversal methods: Breadth First Search and Depth First Search.
Module 5:


Text Books:

Reference Books:
2. Data Structures using C by E. Balaguruswamy.
3. Data Structures, S. Lipscutz Schumaum; Outlines, TMH

CO-PO/PSO Mapping:

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## Module I
### Unit 1: P-N Junctions
- P-N junction diode working, I-V characteristics of a diode, half-wave and full-wave rectifiers, clamping and clipping circuits, Special purpose diode - Zener diode, Varactor diode.

### Unit 2: Bipolar Junction Transistors (BJT)
- Transistor fundamentals and operations, Input output characteristics of BJT in CB, CE, CC configurations, DC operating point, Load line analysis, common-emitter, common-base and common collector amplifiers; design and analysis of the fixed bias, emitter bias with and without emitter resistance circuits, variation of operating point and its stability.

## Module II
### Unit 1: Field Effect Transistors
- JFET- current-voltage characteristics and issues related to its performance, MOSFET structure, I-V characteristics of MOSFET, MOSFET as a switch, small signal equivalent circuits - gain, input and output impedance

### Unit 2: Transistors Amplifier
- Small Signal BJT amplifiers: AC equivalent circuit, hybrid model and their use in amplifier design.

## Module III
### Unit 1 Feedback and Oscillator Circuits
- Concepts of feedback, Effect of positive and negative feedbacks, basic feedback topologies & their properties, Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators.

### Units 2 Fundamentals of Digital Systems
- Decimal, binary, octal, hexadecimal number systems and their conversion, binary weighted codes, signed numbers, 1s and 2s complement codes, error detecting and correcting codes, Binary arithmetic, Binary logic functions, Boolean laws, truth tables, associative and distributive properties, De Morgans theorems, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations,

## Module IV
### Unit: 1 Minimization of Boolean Expressions
Standard representation for logic functions, SOP, POS, K-map representation, and simplification of logic functions using K-map, Quine-McCluskey minimization technique.

**Unit:2 Combinational Circuits**

Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, digital comparator, priority encoders, decoders, ALU.

**Module V**

**Unit:1 Sequential Circuits**

Sequential circuits, flip-flops, latches, the clocked SR flip flop, J, K, T and D types flip-flops, State diagrams and tables, transition table, excitation table and equations, applications of flip-flops,

**Unit:2 Applications of Sequential circuits**

shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters.

**TEXT BOOKS:**


**REFERENCE BOOKS:**


**Web resources:**

1. [https://www.youtube.com/watch?v=yQDfVJzEymI](https://www.youtube.com/watch?v=yQDfVJzEymI)
2. [https://www.tutorialspoint.com](https://www.tutorialspoint.com)
3. [https://www.youtube.com/watch?v=2xXErGeeb_Q](https://www.youtube.com/watch?v=2xXErGeeb_Q)

**Course Outcomes:**
CO1 - Understanding of different basic analog and digital electronic circuits
CO2 - Thorough understanding of biasing techniques
CO3 - Design and understanding of transistor based circuits and their applications
CO4 - Design and analyze combinational and sequential circuits for various applications

**CO-PO/PSO Mapping:**

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CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – High; 2 – Medium; 1 - Low
IOT LAB

PREREQUISITE: Knowledge of SENSORS

Course Objectives:

1. To make students understand the concepts of IoT
2. To explain the introduction to IoT protocols
3. To make students understand the working principles of IoT system
4. To give hands on experience to the students on project design

LIST OF EXPERIMENTS:

1. Introduction to sensors, actuators, processing devices and cloud service model
2. Design a system based on ESP 32 to measure room temperature (using LM 35) and update the data in the cloud
3. Design a IoT system based on ESP 32 to measure soil wetness for the agricultural application
4. Design a IoT system based on ESP 32 to measure water level in the rain water harvesting
5. Design an IoT system based on ESP 32 to measure heart beat
6. Design an IoT system based on ESP 32 based on I2C protocol
7. Design an IoT system based on ESP 32 to implement MQTT protocol
8. Design an IoT system based on ESP 32 to measure air pollution (CO2, CO)
9. Design an IoT system based on ESP 32 for smart lightening (using LDR)
10. IoT for rural empowerment (Case study/PBL)

Course Outcomes:

CO1: Understand the concepts of IoT
CO2: Implement various prototypes
CO3: Design IoT architecture for various applications
CO4: Understand the need of IoT to the society

TEXT & REFERENCES:

Text:

References:

CO-PO/PSO Mapping

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English For Employability Lab
(Common to CSE/EEE/ECE/CSM/CSD/CSC/CSO/MECH)

Prerequisites:
1. Basic knowledge of interpersonal and communication skills.
2. Enriching the speaking and writing ability
3. Basic grammar rules of (LSRW)
4. Basic Spoken English skills

Course Objectives:
1. To improve the communication skills, body language, facial expression and gesture.
2. To be able to understand the concept of employability skills (Quantum dexterity) and enhancing ones’ behavior in the personal, professional and social forum.
3. To evaluate the LSRW (listening, speaking, reading and writing) through assessment.
4. To learn the basic grammar for improving spoken and written communication.
5. To become problem solver, analyze and apply critical and analytical skills.
6. To identify the Employability skills, assigning tasks (Group Discussion, JAM, Role play etc.,) for day today evaluation.

Activity 1- Narration (Historical places, events, Picture narration, Memorable incidents of life)
Self-Introduction, Daily Routine, Likes & Dislikes, Vocabulary, Triangular Activity (Person based- S-P), Imperatives & JAM
Targeted Skills- Listening- Speaking- Audio-Video clips

Activity 2: Quantum of Dexterity (QOD)--- Ability (Personal, Behavioural & Professional)
Request/Permission/Order, Survival kit, Career Objective Professional, Hidden Talents (Personal), Character Traits (Behavioural)
Targeted Skills- Reading-Writing – Concluding an open-ended Story, Creative Writing.

Activity 3: Critical & Analytical Skills
SWOC- (Social & Cultural, Political, Economic, Legal Impact, Technical, Nuances of Pronunciation, Voice Modulation, Neutralizing Mother Tongue Interference, Tongue Twisters for practice,
Targeted Skills- Writing SWOC, Self-Introduction, Exposure to a structured talk.

Activity 4: Flick Flow/Extempore
Targeted Skills- Speaking Skills

Activity 5: On Job Training
Formal & Informal communication, Resume E-mail Etiquette, Telephonic & Interview Etiquette, Situation based- Santa’s Bag, topic/case study-based Group Discussion (Job Consultancy/Role Play)
Targeted Skills- Listening-Writing- Speaking

Course Outcomes: After undergoing this course, the student will be able to;

CO1: Understand the explicit and implicit of importance of employability skills.

CO2: Demonstrate life skills like team work, learning skills, problem solving, attitude, adaptability and flexibility.

CO3: Apply critical and analytical skills to bring out the solution on problem/case study.

CO4: Recognize the need of appropriate words, Phrases & functional grammar and apply them in both spoken and written communication.

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DATA STRUCTURES LAB

Pre-requisite: Programming in C and Problem Solving

Course Objectives:

1. Understand various data representation techniques in the real world.
2. Implement linear and non-linear data structures.
3. Analyze various algorithms based on their time and space complexity.
4. Develop real-time applications using suitable data structure.
5. Identify suitable data structure to solve various computing problems.

Course Outcomes:

1. Identify the appropriate data structures and algorithms for solving real world problems
2. Implement various kinds of searching and sorting techniques.
3. Implement data structures such as stacks, queues, search trees, and hash tables to solve various computing problems.
4. Choose appropriate traversal method to find shortest distance

List of Experiments:

1. Develop a program to read a linear list of items and store it in an array.
   a. Copy the contents from one array to another array
   b. Copy the contents from one array to another array in reverse order
   c. Delete the duplicate elements from an array.

2. Develop a program to implement various sorting techniques:
   a. Insertion sort
   b. Selection Sort
   c. Bubble Sort
   d. Merge Sort
   e. Quick Sort

3. a. Develop a program to create a stack and perform various operations on it.
   b. Develop a program to create a queue and perform various operations on it.

4. Develop programs for the following:
   a. Uses Stack operations to convert infix expression into postfix expression.
   b. Uses Stack operations for evaluating the postfix expression.

5. Design a program to create a singly linked list for the following operations
   a. Insert a Node at Beginning, at Ending and at a given Position
   b. Delete a Node at Beginning, at Ending and at a given Position
   c. Search, Count the Number of Nodes and Display
6. Design a program to create a doubly linked list for the following operations
   a. Insert a Node at Beginning, at Ending and at a given Position
   b. Delete a Node at Beginning, at Ending and at a given Position
   c. Search, Count the Number of Nodes and Display

7. Design a program to create a binary tree and perform various traversals.
   a. In order
   b. Pre Order
   c. Post Order

8. Develop a program to Perform Linear Search and Binary Search on a list stored in an array.

9. Design a program to create a Hash table for the following operations
   a. Insert
   b. Delete
   c. Search

10. Develop programs to implement the following graph traversal algorithms:
    a. Depth first search.
    b. Breadth first search.

Text/Reference Books:
2. Data structures using C - A.S. Tanenbaum, Y. L. angsam, and MJ Augestien, PHI Pearson Education

CO-PO/PSO Mapping Chart:

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**B.Tech II Year–III Sem**

**Subject Code:** 21PC3EE13

**L T P C**

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**Analog and Digital Electronics Lab**

**Prerequisites:** Basic Electronics

**Course Objectives:**

The student should be able to:

- Use appropriate design equations / methods to design the given circuit.
- Know the characteristics of various electronic components.
- Design and analyze small signal amplifier circuits.
- Design and analyze combinational and sequential circuits.

**PART A (Analog Electronic Circuits):**

1. Design and observe P-N junction diode characteristics in forward and reverse bias condition.
2. Design and observe Zener diode characteristics in forward and reverse bias condition. Realize its application as voltage regulator.
3. Design and implement half wave rectifier circuit, and calculate its efficiency.
4. Design and implement full wave rectifier circuit with and without filters, and calculate their efficiency.
5. Design and realize input and output characteristics of common emitter amplifier of BJT.
6. Realize the Input and output characteristics of FET in common source configuration.

**PART B (Digital Electronic Circuits)**

1. Design and realization of Boolean expression using basic gates.
2. Design and realization of Boolean expression using universal gates.
3. Design and implementation of half adder and full adder using universal gates.
4. Design and implement of half sub tractor and full sub tractor using basic gates.
7. Design and realization of Boolean expression using basic gates.
8. Design and realization of Boolean expression using universal gates.
9. Design and implementation of half adder and full adder using universal gates.
10. Design and implement of half sub tractor and full sub tractor using basic gates.

TEXT BOOKS:

Course Outcomes: After completion of this lab the student is able to
CO1-Analyze the physical operation of components
CO2-Apply concepts of electronic circuits across engineering
CO3-Understand the physical operation of digital components
CO4-Analyze how to design digital circuits

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ENVIRONMENTAL SCIENCE
(Common to CSE/EEE/ECE/MECH/CSM/CDS/CSC/CSO)

Course Objectives:
1. Understanding the importance of ecological balance for sustainable development.
2. To educate students about natural resources and their exploitation
3. Understanding the concepts of green chemistry and its applications.

Module I ECOSYSTEMS AND ECOLOGY

UNIT-1: Ecosystem
Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids.

UNIT-2: Ecology
Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

Module II NATURAL RESOURCES

UNIT-1: Classification of Resources
Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources,

UNIT-2: Land and Energy resources
Land resources: Forest resources, Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

Module III BIODIVERSITY AND BIOTIC RESOURCES

UNIT-1: Biodiversity
Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit

UNIT-2: Biotic Resources
Module IV ENVIRONMENTAL POLLUTION AND SOLID WASTE

UNIT-1: Environmental pollution

Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Municipal Solid Waste management, composition and characteristics of e-Waste and its management

UNIT-2: Global Environmental Issues and Global Efforts


Module V Green Chemistry & Hazardous chemicals

UNIT-1: Green Chemistry
Introduction & Principles, green solutions for chemical energy storage, green chemistry solutions will be discussed within the fields of Chemical production: choice of feedstock, solvents, catalysts, synthesis routes including microwave and ultrasonic assisted synthesis.

UNIT -2: Hazardous Chemicals
Classification of hazardous chemicals, transportation of hazardous chemicals, Hazchem code, Storage and handling of hazardous substances, Emergency preparedness (on site & offsite), Safety audit, Concept of fire and explosion, Major accidents involving hazardous substances

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

Course Outcomes:

CO-1: Understand the importance of ecosystem and ecological balance in conservation of biodiversity.

CO-2: Understand the concepts of natural resources and its exploitation.

CO-3: Explain the control of pollution for sustainable environment.

CO-4: Explain the concepts of green chemistry and its applications.
## Course Outcomes (COs)

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### Program Outcomes (POs)

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### Program Specific Outcomes (PSOs)

- PS O 1
- PS O 2

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**CO-PO/PSO Mapping Chart**

(3/2/1 indicates strength of correlation)

- 3 – High; 2 – Medium; 1 - Low
Pre-requisite: Programming for Problem solving Using C

Course Objectives:
1. Acquire programming skills in core Python.
2. Acquire Object-oriented programming skills in Python.
3. Develop the skill of designing graphical-user interfaces (GUI) in Python.
4. Develop the ability to write database applications in Python.

Course Outcomes:
1. Understand operators, precedence of operators, associatively while evaluating expressions in program statements.
2. Distinguish the capabilities of procedural as well as object-oriented programming in Python and demonstrate the same in real world scenario.
3. Demonstrate indexing and slicing mechanisms for extracting a portion of data in a sequence.
4. Extend the knowledge of Python programming to build successful career in software development.

Module I
Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types
Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Sequences - Strings, Lists, and Tuples, Mapping and Set Types

Module II
Conditional Statements: Selection/Conditional Branching Statements: if, if-else, nested if, if-elif-else statement(s).
Iterative Statements – while and for loop, Nested loops, break and continue statement, pass Statement, else Statement used with loops.

Module III
Functions: Communicating with functions, Variable Scope and lifetime, return statement, Types of arguments, Lambda functions, and Recursive functions
Classes and Objects – Defining Classes, Creating Objects, Data Abstraction and Hiding through Classes, Class Method and self-Argument, Class variables and Object variables, __init__() and __del__() method.

Module IV
Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, , Raising Exceptions, Related Modules
Regular Expressions: Introduction, Special Symbols and Characters, Res and Python
Module V


GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

Text Books:

Reference Books:

CO-PO/PSO Mapping

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B.Tech II Year – IV Sem

Subject Code: 21PC4CO01

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SENSORS AND DEVICES

Prerequisite: IoT, ADE

Course Objectives:
- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes:
- Understand the IoT value chain structure (device, data cloud), application areas and technologies involved.
- Analyse IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules
- Market forecast for IoT devices with a focus on sensors
- Explore Internet of Things with the help of preparing projects designed for Raspberry Pi

MODULE-I:
Types: Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

MODULE-II:
IoT - Software defined networks, network function virtualization, difference between SDN and NFV for IoT
M2M Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

MODULE-III:
IoT Physical Devices and Endpoints- Introduction to Arduino and Raspberry Pi
Programming – Interfaces (serial, SPI, I2C), Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

MODULE-IV:
Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, speed control of DC Motor, unipolar and bipolar Stepper motors
Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors

MODULE-V:
IoT Physical Servers and Cloud Offerings– Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT
Course project on IoT Application

TEXT BOOKS:

REFERENCE BOOKS:

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OPERATING SYSTEMS

Course Objective
1. To understand the components, operations of the operating system
2. To interpret the scheduling policies and memory management issues
3. To understand the process concurrency and synchronization
4. To understand the concept of file management

Course Outcomes:
At the end of the course student will be able to
1. Understand the structure of Operating System and its architecture
2. Apply the scheduling strategies for real time implementations
3. Illustrate synchronization problems, deadlock and its techniques
4. Infer Security and Protection Mechanism

Module I
Operating System Introduction: Operating Systems objectives and functions, Computer System Architecture, OS Structure, OS Operations,

Module II

Module III
Memory Management and Virtual Memory - Logical & Physical Address Space, Swapping, Contiguous Allocation,

Module IV
Mass Storage Structure – Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap space Management
Module V
Deadlocks - System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

TEXT BOOKS:

REFERENCE BOOKS:

CO-PO &PSO Mapping:

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</table>
Prerequisite: Basics of computer programming language.

Course Objectives:
1. To enable students, define and describe basic concepts of database managements and applications.
2. To master the basics of SQL and design queries using SQL.
3. To provide students the theoretical concepts of data models and database design.
4. To make students familiarize with relational model, relational algebra, transaction control and concurrency control.
5. To introduce storage structures and access techniques.

Course Outcomes:
1. Describe fundamentals of DBMS, database design and normal forms.
2. Design SQL commands and queries for retrieval and management of data.
3. Summarize database storage structures and access techniques.
4. Understand basics of transaction processing and concurrency control.

Module I
Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS
Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model

Module II
Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views.
Relational Algebra and Calculus: Selection and Projection, Set operations, Joins, Division, More examples on Algebra queries, Tuple relational Calculus, Domain Relational Calculus. Form of Basic SQL Query, Data Definition commands, Data manipulation commands.

Module III
Advanced SQL: SET operators, Data Time Functions, Aggregate Operators, Group by clause, Joins, Advanced Sub queries, Nested Queries, triggers and active databases.

Module IV
Storage and Indexing: Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning
Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods
Module V

Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control, Performance of Locking, Transaction Support in SQL, Introduction to Crash Recovery

Concurrency Control: 2PL, Serializability, and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking

Text Books:


Reference Books:


CO-PO/PSO Mapping:

<table>
<thead>
<tr>
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<td>PO1  PO2  PO3  PO4  PO5  PO6  PO7  PO8  PO9  PO10  PO11  PO12</td>
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<tr>
<td>CO4</td>
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</tbody>
</table>
B.Tech II Year – IV Sem

Subject Code: 21PC4CS09

COMPUTER NETWORKS

Pre requisites:
1. A course on “Programming for problem solving”
2. A course on “Data Structures”

Course Objective
1. The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
2. Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers

Course Outcomes:
At the end of the course student will be able to
1. Gain the knowledge of the basic computer network technology.
2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
3. Obtain the skills of subnetting and routing mechanisms.
4. Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

Module I
Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.
**Physical Layer:** Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

Module II
**Data link layer:** Design issues, framing, Error detection and correction. Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.
**Sliding Window protocols:** A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat

Module III
**Multiple access protocols:** ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.
**Network Layer:** Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms

Module IV
**Transport Layer:** Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.
**Application Layer** – Domain name system, SNMP, Electronic Mail; the World WEB, HTTP
Module V
**Wireless and Mobile Networks:** Cellular Internet Access: An Overview of Cellular Network Architecture, Cellular Data Networks (3G, 4G, 5G)
**Mobile Ad-Hoc Networks:** Introduction to Wireless Ad-Hoc Networks, Sensor Networks, MANETS.

**TEXT BOOKS:**


**REFERENCE BOOKS:**


**CO-PO &PSO Mapping:**

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<tr>
<td>CO4</td>
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</table>
Prerequisite: Basic Programming Skills.

Course Objectives:
To learn the fundamentals of computers.

1. Acquire programming skills in core Python.
2. Acquire Object-oriented programming skills in Python.
3. Develop the skill of designing graphical-user interfaces (GUI) in Python.
4. Develop the ability to write database applications in Python.

Course Outcomes:

1. Acquire programming skills in core Python.
2. Acquire Object-oriented programming skills in Python.
3. Develop the skill of designing graphical-user interfaces (GUI) in Python.
4. Develop the ability to write database applications in Python.

List of Experiments:

Experiment – 1: OPERATORS
a. Read a list of numbers and write a program to check whether a particular element is present or not using membership operators.
b. Read your name and age and write a program to display the year in which you will turn 100 years old.

Experiment – 2: CONTROL STRUCTURES
a. Read your email id and write a program to display the no of vowels, consonants, digits and white spaces in it using if...elif...else statement.
b. Write a Program to find the sum of a Series 1/1! + 2/2! + 3/3! + 4/4! +…….+ n/n!.
   (Input :n = 5, Output : 2.70833)

Experiment – 3: LIST
a. Read a list of numbers and print the numbers divisible by x but not by y (Assume x = 4 and y = 5).
b. Read a list of numbers and print the sum of odd integers and even integers from the list.(Ex: [23, 10, 15, 14, 63], odd numbers sum = 101, even numbers sum = 24)

Experiment – 4: TUPLE
a. Given a list of tuples. Write a program to find tuples which have all elements divisible by K from a list of tuples. test_list = [(6, 24, 12), (60, 12, 6), (12, 18, 21)], K = 6, Output : [(6, 24, 12), (60, 12, 6)]
Experiment – 5: SET
a. Write a program to generate and print a dictionary that contains a number (between 1 and n) in the form (x, x*x).
b. Write a program to perform union, intersection and difference using Set A and Set B.

Experiment – 6: DICTIONARY
a. Write a program to do the following operations:
   i. Create a empty dictionary with dict( ) method
   ii. Add elements one at a time
   iii. Update existing key’s value
   iv. Access an element using a key and also get( ) method
   v. Deleting a key value using del( ) method
b. Write a program to create a dictionary and apply the following methods:
   i. pop( ) method
   ii. pop item( ) method
   iii. clear( ) method

Experiment – 7: STRINGS
a. Given a string, write a program to check if the string is symmetrical and palindrome or not. A string is said to be symmetrical if both the halves of the string are the same and a string is said to be a palindrome string if one half of the string is the reverse of the other half or if a string appears same when read forward or backward.
b. Write a program to read a string and count the number of vowel letters and print all letters except 'e' and 's'.

Experiment – 8: USER DEFINED FUNCTIONS
a. Write a function merge_dict(dict1, dict2) to merge two Python dictionaries.
b. Given a list of n elements, write a linear_search() function to search a given element x in a list.

Experiment – 9: BUILT-IN FUNCTIONS
a. Write a program to demonstrate the working of built-in statistical functions mean ( ), mode ( ), median () by importing statistics library.
b. Write a program to demonstrate the working of built-in trigonometric functions sin ( ), cos ( ), tan ( ), hypot ( ), degrees ( ), radians ( ) by importing math module.

Experiment – 10: CLASS AND OBJECTS
a. Write a program to create a Bank Account class. Your class should support the following methods for
   i) Deposit
   ii) Withdraw
   iii) Get Balance
   iv) Pin Change
b. Write a program to create an employee class and store the employee name, id, age, and salary using the constructor. Display the employee details by invoking employee_info () method and also using dictionary (__dict__).
Reference Books:


CO-PO/PSO Mapping Chart:

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CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – High; 2 – Medium; 1 - Low
Course Objective
1. To do the implementation of operating system concepts
2. To write the code to Implement and modify various concepts in operating systems

Course Outcomes:
1. Implement Inter process communication between two processes
2. Design and solve Synchronization problems
3. Implement scheduling, deadlock and file management
4. Simulate and implement operating system concepts such as memory management

List of Programs:
1. Simulate the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority
2. Simulate the following CPU scheduling algorithms
   a) FCFS b) Priority
3. Simulate all file allocation strategies
   a) Sequential b) Indexed c) Linked
4. Simulate MVT and MFT
5. Simulate all File Organization Techniques
   a) Single level directory b) Two level
6. Simulate all File Organization Techniques
   a) Hierarchical b) DAG
7. Simulate Bankers Algorithm for Dead Lock Avoidance
8. Simulate Bankers Algorithm for Dead Lock Prevention
9. Simulate all page replacement algorithms
   a) FIFO b) LRU c) LFU Etc.
10. Simulate Paging Technique of memory management.

Text Books:

CO-PO &PSO Mapping

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<th>CO-PO</th>
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</table>
Prerequisite: Nil

Course Objectives:

1. Introduce ER data model, database design and normalization.
2. Learn SQL basics for data definition and data manipulation.

Course Outcomes:

1. Design database schema for a given application and apply normalization.
2. Perform operations on the database using SQL commands for data definition and data manipulation.
3. Develop solutions for database applications using procedures, cursors and triggers.
4. Implement joins on the tables.

List of Experiments:

The following programs are to be developed using My SQL / SQL / PL/SQL

Roadway Travels: "Roadway Travels" is in business since 1997 with several buses connecting different places in India. Its main office is located in Hyderabad.

The company wants to computerize its operations in the following areas:

- Reservations and Ticketing
- Cancellations

Reservations & Cancellation: Reservations are directly handled by booking office. Reservations can be made 30 days in advance and tickets issued to passenger. One Passenger/person can book many tickets (to his/her family).

Cancellations are also directly handed at the booking office.

In the process of computerization of Roadway Travels you have to design and develop a Database which consists the data of Buses, Passengers, Tickets, and Reservation and cancellation details. You should also develop query’s using SQL to retrieve the data from the database.

The above process involves many steps like 1. Analyzing the problem and identifying the Entities and Relationships, 2. E-R Model 3. Relational Model 4. Normalization 5. Creating the database 6. Querying. Students are supposed to work on these steps week wise and finally create a complete “Database System” to Roadway Travels. Examples are given at every experiment for guidance to students.
Experiment 1: E-R Model
Analyze the problem carefully and come up with the entities in it. Identify what data has to be persisted in the database. This contains the entities, attributes etc.

Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any.
Example:
**Entities:** 1. BUS 2. Ticket 3. Passenger
**Relationships:** 1. Reservation 2. Cancellation
**Primary Key Attributes:** 1. Ticket ID (Ticket Entity)
   2. Passport ID (Passenger Entity)
   3. Bus_NO (Bus Entity)
Apart from the above mentioned entities you can identify more. The above mentioned are few.
**Note:** *The student is required to submit a document by writing the Entities and Keys to the lab teacher.*

Experiment 2: Concept design with E-R Model
Relate the entities appropriately. Apply cardinalities for each relationship. Identify strong entities and weak entities (if any). Indicate the type of relationships (total / partial). Try to incorporate generalization, aggregation, specialization etc wherever required.

Example: E-R diagram for bus

![E-R Diagram for bus](image)

**Note:** *The student is required to submit a document by drawing the E-R Diagram to the lab teacher.*
Experiment 3: Relational Model

Represent all the entities (Strong, Weak) in tabular fashion. Represent relationships in a tabular fashion. There are different ways of representing relationships as tables based on the cardinality. Represent attributes as columns in tables or as tables based on the requirement.

Different types of attributes (Composite, Multi-valued, and Derived) have different way of representation.

Example: The passenger tables look as below. This is an example. You can add more attributes based on your E-R model. This is not a normalized table.

<table>
<thead>
<tr>
<th>Passenger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Note: The student is required to submit a document by Represent relationships in a tabular fashion to the lab teacher.

Experiment 4: Normalization

Database normalization is a technique for designing relational database tables to minimize duplication of information and, in so doing, to safeguard the database against certain types of logical or structural problems, namely data anomalies. For example, when multiple instances of a given piece of information occur in a table, the possibility exists that these instances will not be kept consistent when the data within the table is updated, leading to a loss of data integrity. A table that is sufficiently normalized is less vulnerable to problems of this kind, because its structure reflects the basic assumptions for when multiple instances of the same information should be represented by a single instance only.

For the above table in the First normalization we can remove the multi valued attribute Ticket_id and place it in another table along with the primary key of passenger.

First Normal Form: The above table can be divided into two tables as shown below.

<table>
<thead>
<tr>
<th>Passenger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Passport ID</th>
<th>Ticket_id</th>
</tr>
</thead>
<tbody>
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<td></td>
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</tbody>
</table>

You can do the second and third normal forms if required. Anyhow Normalized tables are given at the end.
Experiment 5: Installation of Mysql / SQL and practicing DDL commands

Installation of Mysql / SQL. In this session you will learn Creating databases, How to create tables, altering the database, dropping tables and databases if not required. You will also try truncate, rename commands etc.

Example for creation of a normalized “Passenger” table.

```
CREATE TABLE Passenger (  
    Passport_id INTEGER PRIMARY KEY,  
    Name VARCHAR (50) Not NULL,  
    Age Integer Not NULL,  
    Sex Char,  
    Address VARCHAR (50) Not NULL);
```

Similarly create all other tables.

Note: Detailed creation of tables is given at the end.

Experiment 6: Practicing DML commands

DML commands are used to for managing data within schema objects. Some examples:

- SELECT - retrieve data from the a database
- INSERT - insert data into a table
- UPDATE - updates existing data within a table
- DELETE - deletes all records from a table, the space for the records remain

Inserting values into “Bus” table:

```
Insert into Bus values (1234,'hyderabad', 'tirupathi');
Insert into Bus values (2345,'hyderabad','Banglore');
Insert into Bus values (23,'hyderabad','Kolkata');
Insert into Bus values (45,'Tirupathi','Banglore');
Insert into Bus values (34,'hyderabad','Chennai');
```

Inserting values into “Passenger” table:

```
Insert into Passenger values (1, 45,’ramesh’, 45,’M’,’abc123’);
Insert into Passenger values (2, 78,’geetha’, 36,’F’,’abc124’);
Insert into Passenger values (45, 90,’ram’, 30,’M’,’abc12’);
Insert into Passenger values (67, 89,’ravi’, 50,’M’,’abc14’);
Insert into Passenger values (56, 22,’seetha’, 32,’F’,’abc55’);
```

Few more Examples of DML commands:

```
Select * from Bus; (selects all the attributes and display)
UPDATE BUS SET Bus No = 1 WHERE BUS NO=2;
```
Experiment 7: Querying
In this week you are going to practice queries (along with sub queries) using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.

Practice the following Queries:
1. Display unique PNR_no of all passengers.
2. Display all the names of male passengers.
3. Display the ticket numbers and names of all the passengers.
4. Find the ticket numbers of the passengers whose name start with ‘r’ and ends with ‘h’.
5. Find the names of passengers whose age is between 30 and 45.
6. Display all the passengers names beginning with ‘A’
7. Display the sorted list of passengers names

Experiment 8 and Experiment 9: Querying (continued...)
You are going to practice queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
1. Write a Query to display the Information present in the Passenger and cancellation tables. **Hint:** Use UNION Operator.
2. Display the number of days in a week on which the 9W01 bus is available.
3. Find number of tickets booked for each PNR_no using GROUP BY CLAUSE. **Hint:** Use GROUP BY on PNR_No.
4. Find the distinct PNR numbers that are present.
5. Find the number of tickets booked by a passenger where the number of seats is greater than 1. **Hint:** Use GROUP BY, WHERE and HAVING CLAUSES.
6. Find the total number of cancelled seats.

Experiment 10: Triggers
In this session you are going to work on Triggers. Creation of insert trigger, delete trigger, update trigger. Practice triggers using the above database.
**Eg:**
```sql
CREATE OR REPLACE TRIGGER SUN_TRI
AFTER INSERT OR UPDATE OR DELETE ON EMP
DECLARE
DY VARCHAR2 (200);
BEGIN
DY:=TO_CHAR(SYSDATE,'DY');
IF DY='SUN' THEN
RAISE_APPLICATION_ERROR (-20005,'TODAY IS SUNDAY TRANSACTION NOT ALLOWED TODAY');
END IF;
END;
```

Experiment 11: Procedures
In this session you are going to learn Creation of stored procedure, Execution of procedure and modification of procedure. Practice procedures using the above database.
**Eg:**
```sql
CREATE PROCEDURE myProc()
BEGIN
SELECT COUNT (Tickets) FROM Ticket WHERE age>=40;End;
```
**Experiment 12: Cursors**

In this session you need to do the following: Declare a cursor that defines a result set. Open the cursor to establish the result set. Fetch the data into local variables as needed from the cursor, one row at a time. Close the cursor when done.

**Eg:**

```sql
DECLARE 
CURSOR A IS 
SELECT * FROM EMP; 
B A%ROWTYPE; 
BEGIN 
OPEN A; 
LOOP 
FETCH A INTO B; 
EXIT WHEN A%NOTFOUND; 
DBMS_OUTPUT.PUT_LINE('EMP NO IS ' || B.EMPNO); 
DBMS_OUTPUT.PUT_LINE('ENAME IS ' || B.ENAME); 
DBMS_OUTPUT.PUT_LINE('SAL IS ' || B.SAL); 
DBMS_OUTPUT.PUT_LINE('MGR NO IS ' || B.MGR); 
DBMS_OUTPUT.PUT_LINE('COMM IS ' || B.COMM); 
DBMS_OUTPUT.PUT_LINE('HIREDATE IS ' || B.HIREDATE); 
DBMS_OUTPUT.PUT_LINE('DEPTNO IS ' || B.DEPNO); 
DBMS_OUTPUT.PUT_LINE('EMP JOB IS ' || B.JOB); 
DBMS_OUTPUT.PUT_LINE('*************************'); 
END LOOP; 
CLOSE A; 
END;
```

**Text Books:**

**Reference Books:**
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education

**CO-PO/PSO Mapping Chart**

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<tr>
<td>CO4</td>
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SENSORS AND DEVICES LAB

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes:

- CO-1: Understand the terminology, technology and its applications
- CO-2: Design IoT applications using Raspberry PI platform
- CO-3: Analyse usage of sensors and devices in IoT applications
- CO-4: Understand the concept of M2M (machine to machine) with necessary protocols

LIST OF PROGRAMS:

1. Connect an LED to GPIO pin 25 and control it through command line.
2. Connect an LED to GPIO pin 24 and a Switch to GPIO 25 and control the LED with the switch.
3. The state of LED should toggle with every press of the switch Use DHT11 temperature sensor and print the temperature and humidity of the room with an interval of 15 seconds.
4. Use joystick and display the direction on the screen.
5. Use Light Dependent Resistor (LDR) and control an LED that should switch-on/off depending on the light.
6. Create a traffic light signal with three coloured lights (Red, Orange and Green) with a duty cycle of 5-2-10 seconds.
7. Switch on and switch off a DC motor based on the position of a switch.
8. Convert an analog voltage to digital value and show it on the screen.
9. Create a door lock application using a reed switch and magnet and give a beep when the door is opened.
10. Control a 230V device (Bulb) with Raspberry Pi using a relay.
11. Control a 230V device using a threshold temperature, using temperature sensor.
12. Create an application that has three LEDs (Red, Green and white). The LEDs should follow the cycle (All Off, Red On, Green On, White On) for each clap (use sound sensor).

TEXT BOOKS:

REFERENCE BOOKS:

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CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – High; 2 – Medium; 1 - Low

Program Specific Outcomes*
DOING ENGINEERING-I

Pre-requisite: Basic Knowledge on Computers and C language

Course Objectives:
1) To Provide knowledge of different Smart System applications.
2) To provide knowledge of Arduino boards, Arduino as IDE, programming language, platform and basic components
3) Develop skills to design and implement various smart system application.
4) To know the basics of micro-controllers and sensors very quickly and can start building prototype.

Course Outcomes:
1) Able to Design Smart systems applications.
2) Understand about any new IDE, compiler, and MCU chip in Arduino compatible boards or similar types.
3) Understand Arduino programming with embedded C.
4) Learn how to prototype circuits with a breadboard

I-Microprocessor and Arduino
Introduction to Microprocessor, Micro controller, source mode and sink mode.
Arduino pin diagram, Types of Arduino boards and its pin description.

II-LED, LCD, Buzzer & Interfacing
Various types of Actuators, LED introduction, Buzzer introduction, Introduction to LCD
16x 2, Types of LCD’s, LCD Pin diagram, Interfacing LED, Buzzer & LCD to Arduino.

LCD: Displaying name on LCD, Setting cursor position in LCD, Display and NO display in LCD, Scrolling Display towards left and right
LED: LED ON & OFF, TWO LED interfacing (Alternate LED ON & OFF), 1234 and 4321 LED pattern. LCD display with LED status.
Buzzer: Interfacing Buzzer with LED and LCD.

III-Motor driver and Interfacing to Arduino
L293D Pin diagram, Introduction to L293D Motor driver. Interfacing DC motors to Arduino, Designing robot

IV-Sensors and Programming
Introduction to soil moister sensor, gas sensor, Ultra Sonic sensor, Temperature sensor, LDR sensor, IR sensor and PIR sensor and its pin configurations.
1. Interfacing Soil moister sensor & gas sensor to Arduino
2. Interfacing LED, LCD and gas sensor
3. Interfacing Ultrasonic sensor to Arduino and displaying distance on screen
4. Interfacing Ultrasonic sensor to LED, LCD
5. Interfacing Temperature sensor to Arduino and Interfacing with LED.
6. Interfacing LDR sensor to Arduino and interfacing with LED.
7. Interfacing IR sensor to Arduino and interfacing with LED and buzzer.
8. Interfacing to PIR sensor to Arduino.
V-Bluetooth & RFID
Introduction, Principle, Bluetooth pin configuration, Two modes of Bluetooth, Interfacing Bluetooth to Arduino and LCD.
RFID: Introduction RFID, Principle, Interfacing to Arduino and LED.

Expecting outcomes through assessments:

1: Designing Automatic Street Light
2: Smart stick for blind person.
3: Design Smart water tank

TEXTBOOKS:

REFERENCE BOOKS:

CO-PO MAPPING:

<table>
<thead>
<tr>
<th>Course Outcomes (COs)</th>
<th>Program Outcomes (POs)</th>
<th>Program Specific Outcomes*</th>
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CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – High; 2 – Medium; 1 - Low