TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
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B.TECH – COMPUTER SCIENCE & ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
Course Structure R-20

SEMESTER III

S.No.	Class	Course Code	Name of the Subject	L	T	P	C
1	HS	CHSM1	Business Economics and Financial Analysis	3	0	0	3
2	BS	CBSM5	Statistical Methods	3	0	0	3
3	ES	CESLC1	Logic Circuits Design	3	0	0	3
4	PC	C73PC1	Database Management Systems	3	0	0	3
5	PC	C73PC2	Data Structures	3	0	0	3
6	PC	C73PC3	Operating Systems	3	0	0	3
7	ES	CESLC2	Logic Circuits Design Lab	0	0	2	1
8	PC	C73PC4	Database Management Systems Lab	0	0	2	1
9	PC	C73PC5	Data Structures Lab	0	0	2	1
10	MC	MC003	Cultural Activity	0	0	0	Satisfactory
Total Credits				**18**	**0**	**6**	**21**

Mandatory Course: Cultural Activity
The student should participate in culture activity (Music/Dance/Singing/etc.) conducted by the College, student should produce the participation certificate for clearing this course.

SEMESTER IV

S.No.	Class	Course Code	Name of the Subject	L	T	P	C
1	BS	CBSM6	Probability & Algebra	3	0	0	3
2	PC	C74PC1	Introduction to Computer Vision	3	0	0	3
3	PC	C74PC2	Software Engineering	3	0	0	3
4	PC	C74PC3	Design and Analysis of Algorithms	3	0	0	3
5	PC	C74PC4	Formal Language & Automata Theory	3	0	0	3
6	PC	C74PC5	R Programming	3	0	0	3
7	PC	C74PC6	Scripting Languages Lab (Ruby, Perl, PHP, JS)	1	0	2	2
8	PC	C74PC7	R Programming Lab	0	0	2	1
9	MC	MC004	Video with Social Messages	0	0	0	Satisfactory
Total Credits				**18**	**0**	**6**	**21**

Mandatory Course: Video with Social Messages
Student should make video with social messages. This has to be uploaded in the youtube.com, by maintaining the terms and conditions of youtube.com. Student should produce youtube.com link with screen shot for clearing this mandatory course.

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CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

B.Tech III Semester **L/T/P/C**
3 /0/ 0/ 3

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS (CHSM1)

Course Objectives:

1. To learn the basic business type of the organization.
2. To aquire the knowledge and impact of the economy on business firms.
3. To analyse the business from the financial perspective.
4. To know the financial position of the company.

Course Outcomes:

1. Analyze the total structure of the business & able to identify and classify the different types of business entities.
2. Asses the demand & supply analyses with the help of various measures and types of Elasticity of demand.
3. Infer the knowledge about production and cost analysis for product and services.
4. Interpret the fundamental concepts related to financial accounting.
5. Predict the financial position by analyzing the financial statement of the company through various ratios.

UNIT I
Introduction to Business and Economics

Business: Define Business, characteristics of business, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company.
Economics: Significance of Economics, Micro and Macro Economic Concepts and Importance of National Income, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist.

UNIT II
Demand Analysis

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Steps in Demand Forecasting, Methods of Demand Forecasting.

UNIT III
Production, Cost, Market Structures & Pricing

Production Analysis: Production function, Law of returns to scale, Internal and External Economies of Scale.
Cost Analysis: Cost concepts, Types of costs, Break-Even Analysis (BEA)
Pricing: Types of pricing, product life cycle, **GST (Goods & Service Tax)**

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS (CHSM1)

Market Structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic competition, oligopoly.

UNIT IV
Financial Accounting

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Accounts.

UNIT V
Financial Analysis through Ratios

Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Text Books:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.
4. Rakesh Garg, Sandeep Garg Hand book of GST in India.
5. A.R. Aryasri (2011) Managerial Economics and Financial Analysis, TMH, India.

Reference Books:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e,Vikas Publications, 2013.

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STATISTICAL METHODS (CBSM5)

Course Objectives: To learn:

1. To introduce the concepts of Statistics.
2. To understand the basic statistical tools for analysis & interpretation of qualitative and quantitative data.
3. To understand the Sampling techniques of population , and to estimate the parameters.
4. Testing of Hypothesis for Large and small samples.
5. To understand the linear relationship between two variables in correlation.
6. To understand the mathematical measure of the average relationship in regression analysis.

Course Outcomes:

After learning the contents of this course, the student must be able to
CO1: Apply Statistical logic for solving the problems.
CO2: Analyse the qualitative & quantitative data.
CO3: Apply the sampling techniques.
CO4: Find the error in sampling distributions.
CO5: Test the hypothesis and give the inference to the given data.
CO6: Predict the value of dependent variable by regression analysis.

UNIT I
Introduction of Statistics

Functions of statistics, Collection of data, Classification of data, Tabulation of data, diagramatic and Graphical representation of data. Measures of Central Tendency- Mean, Median, Mode, Geometric Mean and Harmonic Mean.

UNIT II
Measures of Dispersion

Range, Quartile deviation, Mean Deviation, Standard deviation and Coefficient of variation, Skewness: Karl Pearson's co-efficient of skewness, Bowley's co-efficient of skewness, Kelleys co-efficient of skewness, Kurtosis.

UNIT III
Sampling Distributions

Sampling distributions of means (σknown and unknown), Method of Estimation, Point estimations, Maximum Error, Interval estimations.

STATISTICAL METHODS (CBSM5)

UNIT IV
Testing of Hypothesis

Null hypothesis-alternative hypothesis Type-1, Type-2 errors, critical region, testing of single mean and two means, (large and small samples). Test of Hypothesis for the single proportion and difference between the two proportions.

UNIT V
Analysis of Variance

One Way and Two Way ANOVA ,Correlation Analysis-Scatter diagram, Karl Pearson's Coefficient of correlation, Spearman's Rank correlation, Regression Analysis-Concept, least square fit of a linear regression, two lines of regression, Properties of regression coefficients.

Text Books:

1. Gupta S.C&V.K. Kappor., Fundamentals of Mathematical Statistics, S Chand Publishers.
2. Introduction to Statistics by Wolfgang Karl Hardle, Sigbert Klinke, Bernd Ronz, Springer (e- BOOK).

Reference Books:

1. Probability & Statistics for Engineers by G.S.S. Bhisma Rao, Sci Tech Publications.
2. Business Statistics, 1e, Tata McGraw Hill, 2015.

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LOGIC CIRCUITS DESIGN (CESLC1)

Course Objective:

The objective of this course is to understand the significance of converting from mechanical era to electronic era, learn fundamentals of assembly language.

Course Outcomes:

After completion of course, the student will be able to

1. Understand the various number systems and logic gates.
2. Solve boolean expressions using minimization methods and design the sequential and combinational circuits.
3. Study the flip flops and their excitation tables
4. Learn register transfer language and micro-operations
5. Understand about memory, RAM and ROM.

UNIT I
Number System & Logic Gates

Digital Systems, Binary Numbers, Number base conversions, Octal, Hexadecimal and other base numbers, Excess-3 code, Gray code, complements, signed binary numbers, binary codes, binary storage and registers, binary logic, Boolean algebra and logic gates, Basic theorems and properties of Boolean Algebra, Boolean functions, canonical and standard forms, Digital Logic Gates, Implementation of basic gates using universal gates.

UNIT II
Gate -Level Minimization

The K-Map Method (3, 4, 5, Variables) sum of products, product of sums simplification, don’t care conditions.

Combinational Circuits (CC)

Analysis procedure, Design Procedure, Combinational circuit for different code converters and other problems, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, De-multiplexers.

LOGIC CIRCUITS DESIGN (CESLC1)

UNIT III
Flip-Flops

Basic Latch, SR and D latches, Master Slave edge triggered D Flip-flop, T Flip-Flop, and JK Flip Flops, Analysis of clocked sequential circuits. State Reduction and assignment, Flip-Flop Excitation tables, Design procedure. Registers, Shift registers, Ripple counters, Synchronous counters, other counters.

UNIT IV
Register Transfer and Micro-Operations

Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.

UNIT V
Memory

Introduction, Random-Access memory, Memory decoding, ROM, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.

Text Books:

1. Digital Design, M. Morris Mano, M.D.Ciletti, 5th edition, Pearson.
2. Computer System Architecture, M.Morris Mano, 3rd edition, Pearson.

Reference Books:

1. Fundamentals of Logic Design, C. H. Roth, L. L. Kinney, 7th edition, Cengage Learning.
2. Fundamentals of Digital Logic & Micro Computer Design, 5TH Edition, M. Rafiquzzaman, John Wiley.
3. R.P.Jain “Modern Digital Electronics” Tata McGraw Hill, 4th edition2009.

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DATABASE MANAGEMENT SYSTEMS (C73PC1)

Course Objective:

It emphasizes the understanding of the fundamentals of relational systems including data models, databases.

Course Outcomes:

After completion of this course, the student will be able to

1. Demonstrate the basic elements of a relational database management system, and identify the data models for relevant problems.
2. Design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
3. Apply normalization for the development of application software.
4. Understand transaction processing, concurrency control and recovery techniques.
5. Understand the indexing data structures and hashing.

UNIT I
Introduction and Basic Concepts

File organization for conventional data management system, Higher-level file organization for DBMS, Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators. Relational Model-Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity, constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT II
Relational Algebra and Calculus

Preliminaries, Relational Algebra, Relational calculus, Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.
Introduction to Database design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

DATABASE MANAGEMENT SYSTEMS (C73PC1)

UNIT III
SQL

SQL data definition and Data types, Schema and catalog concepts in SQL, Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values, Complex Integrity Constraints in SQL, Triggers and Active Data bases, Designing Active Databases, NoSQL database (MongoDB introduction).
Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms - 1NF, 2NF, 3NF, Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT IV
Transaction Management

Transactions, Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, serializability and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels. Concurrency Control, Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multi-version Schemes. Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of non-volatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT V
Indexing

Index Data Structures, and Comparison with File Organizations. Tree-Structured Indexing, Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete., Hash- Based Indexing, Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

Text Books:

1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition.
2. Database System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education(India) Private Limited l, 6th edition.

Reference Books:

1. Database Systems, 6th edition, R Elmasri, Shamkant B.Navathe, Pearson Education.
2. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning.
3. Introduction to Database Management, M. L. Gillenson and others, Wiley, Student Edition.
4. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
5. Introduction to Database Systems, C. J. Date, Pearson Education.

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DATA STRUCTURES (C73PC2)

Course Objective:

Make to understand the significance of data structures and imply them in building efficient algorithms.

Course Outcomes:

After completion of this course the student will be able to

1. Understand the concepts of time and space complexities.
2. Understand the concept of Abstract Data Type.
3. Choose appropriate data structures to represent data items in real world problems.
4. Analyze the search and space complexities of algorithms.
5. Design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees, and implement various searching and sorting techniques.

UNIT I
Basic Concepts

Data objects and Structures, Algorithm Specification-Introduction, Recursive algorithms, Data abstraction, Performance analysis- Time complexity and Space complexity, Asymptotic Notation-Big O, Omega and Theta notations, Complexity Analysis Examples, Introduction to Linear and Non Linear data structures.

UNIT II
Representation of Single, Two Dimensional Arrays and their Applications

Sparse matrices-array and linked representations. Linear list ADT-array representation and linked list representation, Singly Linked Lists-Operations Insertion, Deletion, Circular linked lists-Operations for Circular linked lists, Doubly Linked Lists Operations- Insertion, Deletion. Stack ADT, definition, array and linked list implementations, applications-infix to postfix conversion, Postfix expression evaluation, recursion implementation, Queue ADT, definition, array and linked list, Implementations, Circular queues-Insertion and deletion operations, Polynomial.

UNIT III
Trees

Definition, terminology, Binary trees-definition, Properties of Binary Trees, Binary Tree ADT, representation of Binary Trees-array and linked representations, Binary Tree traversals, threaded binary trees, Priority Queues –Definition and applications, Max Priority Queue ADT implementation-Max Heap-Definition, Insertion into a Max Heap, Deletion from a Max Heap.
Disjoint set ADT - Equivalence relations, the dynamic equivalence problem, Basic data structure, Smart union algorithms, Path compression, worst case for union by rank and path compression, and an application - generation of mazes.

DATA STRUCTURES (C73PC2)

UNIT IV
Searching

Linear Search, Binary Search, Hashing-Introduction, hash tables, hash functions, Overflow Handling, Comparison of Searching methods.
Sorting: Insertion Sort, Selection Sort, Radix Sort, Quick sort, Heap Sort, Merge sort, Comparison of Sorting methods.
External sorting-Model for external sorting, basic external sorting algorithm, multi-way merge, poly- phase merge, replacement selection.

UNIT V
Graphs

Definitions, Terminology, Applications and more definitions, Properties, Graph ADT, Graph Representations- Adjacency matrix, Adjacency lists, Graph Search methods - DFS and BFS, Complexity analysis. Search Trees Binary Search Tree ADT, Definition, Operations- Searching, Insertion and Deletion, Balanced search trees-AVL Trees-Definition and Examples only, B-Trees-Definition and Examples only, Red Black Trees-Definitions and Examples only, k-d trees, Comparison of Search Trees.

Text Books:

1. Data structures, Algorithms and Applications in C++, 2nd Edition, Sartaj Sahni, Universities Press.
2. Data structures and Algorithms in C++, Adam Drozdek, 4th edition, Cengage learning.

Reference Books:

1. Data structures with C++, J. Hubbard, Schaum’s outlines, TMH.
2. Data structures and Algorithms in C++, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.
3. Data structures and Algorithm Analysis in C++, 3rd edition, M. A. Weiss, Pearson.
4. Classic Data Structures, D. Samanta, 2nd edition, PHI.

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OPERATING SYSTEMS (C73PC3)

Course Objective:

Analyze the basic components of a computer operating system, and the interactions among the various components. This course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.

Course Outcomes:

1. Understand the basic concepts of operating system.
2. Understand the CPU scheduling and process scheduling.
3. Detect deadlocks and recovery the deadlocks using different mechanisms.
4. Understand the virtual memory management and storage file management system.
5. Implementing the file system.

UNIT I
Overview

Introduction-Operating system objectives, User view, System view, Operating system definition, Computer System Architecture, OS Structure, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments. Operating System services, User and OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure.

UNIT II
CPU Scheduling Process Concepts

The Process, Process State, Process Control Block, Threads, Process Scheduling, Scheduling Queues, Schedulers, Context Switch, Operations on Processes, System calls fork(),exec(),wait(),exit(), Inter-process communication-ordinary pipes and named pipes, message queues, shared memory, in Unix.
Process Scheduling-Basic concepts, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, Real Time Scheduling, Thread scheduling, Linux scheduling and Windows scheduling. Process Synchronization, Background, The Critical Section Problem, Peterson's solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization in Linux and Windows.

UNIT III
Deadlocks-System

Deadlocks-System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.
Memory Management: Memory Management Strategies, Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.

OPERATING SYSTEMS (C73PC3)

UNIT IV
Virtual Memory

Virtual Memory Management Background, Demand Paging, Copy-on-Write, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing, Virtual memory in Windows. Storage Management File System- Concept of a File, System calls for file operations - open (), read(), write (), close (), seek (), unlink (), Access methods, Directory and Disk Structure, File System Mounting, File Sharing.

UNIT V
File System

File System Structure, File System Implementation, Directory Implementation, Allocation methods, Free-space Management, Efficiency, and Performance. Overview of Mass Storage Structure. System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection.

Text Book:

1. Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, Greg Gagne, 8th Edition, Wiley, 2016 India Edition.
2. Operating Systems – Internals and Design Principles, W. Stallings, 7th Edition, Pearson.

Reference Books:

1. Modern Operating Systems, Andrew S Tanenbaum, 3rd Edition, PHI
2. Operating Systems: A concept-based Approach, 2nd Edition, D.M. Dhamdhere, TMH.
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.
4. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
5. Principles of Operating systems, Naresh Chauhan, Oxford University Press.

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LOGIC CIRCUITS DESIGN LAB (CESLC2)

Course Objective:

To understand and implement the Logic gates, Combinational, Sequential Circuits using Hardware component.

Course Outcomes:

1. Apply the fundamentals of digital logic gates to design combinational and sequential circuits.
2. Analyze and interpret the results obtained for logic gates and various combinational and sequential circuits.

Exercises in Digital Logic Design:

1. Design Logic gates using minimum number of Universal (NAND and NOR)gates.
2. Identify the logic gates required to design a Full Adder, and Design it using them.
3. Analyze and formulate the relationship between input lines and control lines in Multiplexers.
4. Design and implement the 4:1 MUX, 8:1 MUX using gates/ICs.
5. Design and Implement a 3 to 8 decoder using gates.
6. Design a 4 bit comparator using gates/IC.
7. Design and Implement a 4 bit shift register using Flip flops and draw the timing diagrams.
8. Design and Implement a Decade counter and draw the timing diagram.
   i. Deign a 4-bit Gray to Binary and Binary to Gray Converter.
   ii. Design a 16 bit Adder/ Subtractor using 4-bit Adder /Subtractor IC's.
   iii. Design a 3x8 Decoder.
   iv. Design a16x4 priority encoder using two 8x3 priority encoder.
   v. Design a 16x1 multiplexer using 8x1 multiplexer.
   vi. Design a 16bit comparator using 4 bit comparators.
   vii. Design an 8 bit parallel load and serial out shift register using two 4 bit shift register.
   viii. Design an 8 bit serial in and serial out shift register using two 4 bit shift register.
   ix. Deign a Ring counter and twisted ring counter using a 4-bit shift register.
   x. Design a model to 53 counter using two decade counters.
   xi. Design a 4 digit hex counter using synchronous one digit hex counters.
   xii. Design a 4 digit hex counter using Asynchronous one digit hex counters.
9. Design a 4 bit pseudo random sequence generator using 4-bit ring counter.

Experiment # 01
Realization of Combinational circuits

LOGIC CIRCUITS DESIGN LAB (CESLC2)

Description: Five binary inputs of a digital logic circuit are designated as A, B, C, D and E. The circuit has three outputs, namely X, Y and Z. X should output 0, only if A is 0 and C and E both are 1. In all other cases X must remain 1. Y should output 0, if both B and C are 0 and D and E are 1. In all other cases Y must remain as 1. Z goes low if A, D and E are 1 and B and C are 0. Otherwise Z remains high. Prepare a truth table for the logic and then design a suitable circuit to implement it.

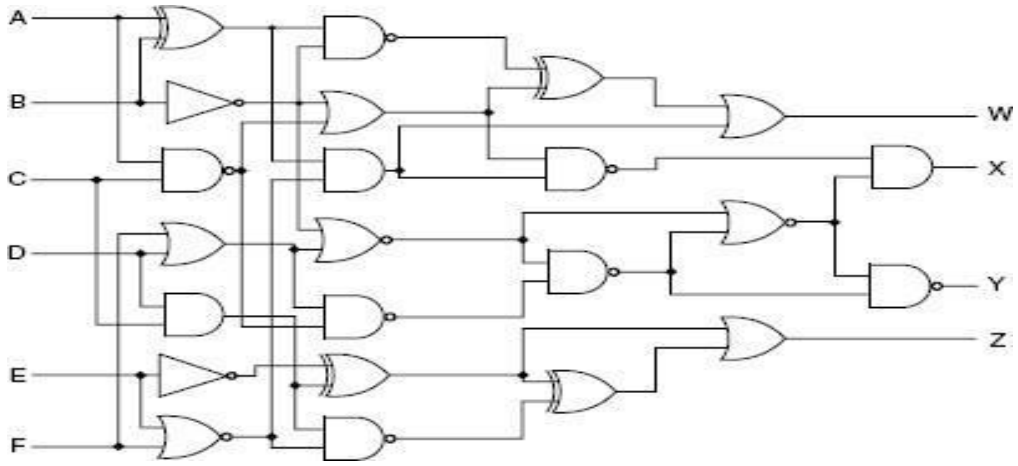
Task1: Identify the Logic gates required with their functionalities to implement the given scenario

Task2: Apply different inputs to the Logic gates and check the functionality

Task3: Prepare a Complete Truth table for the scenario

Task4: Design a suitable circuit to implement it.

1. a) Generate the truth table of the following circuit with six inputs A, B, C, D, E and F and four outputs W, X, Y and Z.



1) Study the Truth tables for different Logicgates
2) Apply different inputs to the Logic gates and check thefunctionality
3) Analyse the outputs of the Logicgates
4) Generate the truth table for theCircuit.

2.b) A circuit has five inputs as A, B, C, D and E. Its six outputs are U, V, W, X, Y and Z. Design the circuit defined by the following truth table.

A	B	C	D	E	U	V	W	X	Y	Z
1	0	1	X	x	0	1	x	x	x	x
X	x	0	1	0	x	x	1	1	x	x
1	x	X	X	1	1	x	x	x	0	1
X	1	X	0	x	x	0	0	0	1	0

1) Study and Analyze different input combinations for the given table.
2) Develop the Truth table from the given table.
3) Design the circuit from the truth table.
4) Verify the output.

LOGIC CIRCUITS DESIGN LAB (CESLC2)

3.c) Design a 4-bit combinational circuit to increment (A circuit that adds one to a 4-bit binary number) using 4 Half-adders.

1) Understand the combinational circuit design
2) Analyze the functionality of an increment circuit.
3) Design the circuit using half adders

Experiment # 02
Design of ALU with two select-lines

Description: Design a 4-bit ALU with inputs A0–A3, B0–B3 and Cin. It is to have 4-bit output Y0–Y3 and Cout. The ALU would have two select lines to implement any one of the following four functions as per the pattern of select lines.

Select lines	Function	Remarks
00	A + B + Cin	Add with carry
01	A-B-Cin	Subtract with borrow
10	A AND B	Logical AND
11	A OR B	Logical OR

Task1: Identify the Logic gates required to design an ALU.
Task2: Design the Adder / subtractor circuit of ALU with the given condition.
Task3: Design the Logical AND/Logical OR circuit of ALU with the given condition.
Task4: Test the circuit to get the required output.

Experiment # 03
Design of ALU with two states

Description: Design an ALU capable of performing multiplication of two 4-bit numbers by producing 8-bit result, using Booth's algorithm. The unit may be hardware controlled in which case the complete hardware design to be implemented. Alternately the unit may micro-coded, in which case all signals and micro-steps are to be specified.
Task1: Identify the Logic gates required to design an ALU
Task2: Design the ALU circuitry for Multiplication
Task3: Test the circuit with different inputs for multiplication
Task4: Verify and record the output.

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CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

B.Tech III Semester **L/T/P/C**
0 /0/ 2/ 1

DATABASE MANAGEMENT SYSTEMS LAB (C73PC4)

Course Objective:

To emphasize on designing, developing and querying a database in the context of example database "Roadway travels".

Course Outcomes:

After Completion of this course the student will be able to
1. Design and implement a database schema for a given problem.
2. Apply the normalization techniques for development of application software to realistic problems.
3. Formulate queries using SQL DML/DDL/DCL commands.
4. Develop application programs using 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:
Reservation & 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 queries 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-RModel
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.

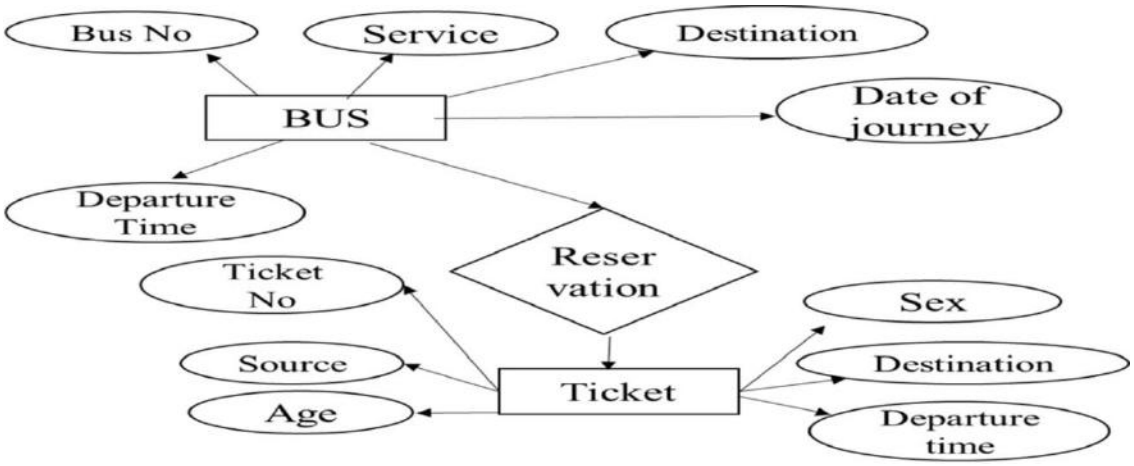
Experiment 1: E-R Model
Analyse the problem carefully and come up with the entities in it. Identify what data has to be persisted in the database. This contains the entities, attributes etc.
Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if 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.

DATABASE MANAGEMENT SYSTEMS LAB (C73PC4)

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



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.

Passenger Name	Age	Sex	Address	PassportID	Ticket_ID

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 with in 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.

Passenger Name	Age	Sex	Address	PassportID

PassportID	Ticket_ID

You can do the second and third normal forms if required. Any, how Normalized tables are given at the end.

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Experiment 5: Installation of Mysql and practicing DDL commands

Installation of MySql. In this week student will learn Creating databases, How to create tables, altering the database, dropping tables and databases if not required. Student 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.

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,'hyderabd','Banglore');

Insert into Bus values (23,'hyderabd','Kolkata');

Insert into Bus values (45,'Tirupathi,'Banglore');

Insert into Bus values (34,'hyderabd','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 student 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 and45.
6. Display all the passengers names beginning with'A'
7. Display the sorted list of passengers names

Experiment 8: and Experiment 9: Querying (continued…)

Student are going to practice queries using Aggregate functions (COUNT, SUM, AVG, and MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

Write a Query to display the Information present in the Passenger and cancellation tables.

1. Display the number of days in a week on which the 9W01 bus is available.
2. Find number of tickets booked for each PNR_no using GROUP BYCLAUSE.
3. Find the distinct PNR numbers that are present.
4. Find the number of tickets booked by a passenger where the number of seats is greater than1.
   Hint: Use GROUP BY, WHERE and HAVING CLAUSES.
5. Find the total number of cancelled seats.

DATABASE MANAGEMENT SYSTEMS LAB (C73PC4)

Experiment 10: PL/SQL

1. Write a PL/SQL block for Addition of Two Numbers
2. Write a PL/SQL block for IF Condition
3. Write a PL/SQL block for IF and else condition
4. Write a PL/SQL block for greatest of three numbers using IF ANDELSEIF
5. Write a PL/SQL block for summation of odd numbers using for LOOP.

Experiment 11: Triggers

Creation of insert trigger, delete trigger, update trigger. Practice triggers using the above database.
Eg: CREATE TRIGGER updcheck BEFORE UPDATE ON passenger
FOR EACH ROW
BEGIN
IF NEW.TickentNO> 60 THEN SET New.Tickent no = Ticket no; ELSE
SET New.Ticketno = 0; END
IF; END;

Experiment 12: Procedures

Learn creation of stored procedure, Execution of procedure and modification of procedure. Practice procedures using the above database.

Eg: CREATE PROCEDURE myProc() BEGIN
SELECT COUNT (Tickets) FROM Ticket WHERE age>=40; End;

Experiment 13 Cursors

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.

CREATE PROCEDURE myProc(in_customer_id INT) BEGIN
DECLARE v_idINT;
DECLARE v_name VARCHAR (30);
DECLARE c1 CURSOR FOR SELECT stdId, stdFirstname FROM students WHERE stdId=in_customer_id;
OPEN c1;
FETCH c1 into v_id, v_name; Close c1; END;
Tables BUS
Bus No: Varchar: PK (public key) Source : Varchar Destination : Varchar
Passenger
PPNO: Varchar (15)) : PK Name: Varchar (15) Age : int (4) Sex:Char (10) : Male / Female Address: VarChar (20)
Passenger_Tickets
PPNO: Varchar (15)) : PK Ticket_No: Numeric (9)
Reservation
PNR_No:Numeric(9):FKJourney_date:datetime(8)No_of_seats:int(8)Address:Varchar(50) Contact_No: Numeric (9) --> Should not be less than 9 and Should not accept any other character other than Integer Status: Char (2) : Yes /No
Cancellation
PNR_No: Numeric(9) : FK Journey_date : datetime(8) No_of_seats : int (8) Address : Varchar
(50) Contact_No: Numeric (9) --> Should not be less than 9 and Should not accept any other character other than Integer Status: Char (2) : Yes / No
Ticket
Ticket_No: Numeric (9): PK Journey_date : datetime(8) Age : int (4) Sex:Char(10) : Male / Female Source : Varchar Destination : Varchar Dep_time : Varchar

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CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

B.Tech III Semester **L/T/P/C**
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DATA STRUCTURES LAB (C73PC5)

Course Objective:

To write and execute programs in C++ to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees, implement various sorting and searching algorithms.

Course Outcomes:

1. Able to identify the appropriate data structures and algorithms for solving realworld problems.
2. Able to implement various kinds of searching and sorting techniques.
3. Able to implement data structures such as stacks, queues, Search trees, and hash tables to solve various computing problems.
4. Able to implement different disjoint set operations and k-d trees.

C++ Programming Concepts

Review of C, input and output in C++, functions in C++-value parameters, reference parameters, Parameter passing, function overloading, function templates, Exceptions- throwing an exception and handling an exception, arrays, pointers, new and delete operators, class and object, access specifies, friend functions, constructors and destructor, Operator overloading, class templates, Inheritance and Polymorphism.

List of Programs to be performed during the Course

1. Write a C++ program that uses functions to perform the following:
   a) Create a singly linked list of integers.
   b) Delete a given integer from the above linked list.
   c) Display the contents of the above list after deletion.
2. Write a template based C++ program that uses functions to perform the following:
   a) Create a doubly linked list of elements.
   b) Delete a given element from the above doubly linked list.
   c) Display the contents of the above list after deletion.
3. Write a C++ program that uses stack operations to convert a given infix expression into its postfix equivalent, Implement the stack using an array.
4. Write a C++ program to implement a double ended queue ADT using an array, using a doubly linked list.
5. Write a C++ program that uses functions to perform the following:
   a) Create a binary search tree ofcharacters.
   b) Traverse the above Binary search tree recursively in preorder, in order and postorder,
6. Write a C++ program that uses function templates to perform the following:
   a) Search for a key element in a list of elements using linear search.
   b) Search for a key element in a list of sorted elements using binarysearch.

DATA STRUCTURES LAB (C73PC5)

7. Write a C++ program that implements Insertion sort algorithm to arrange a list of integers in ascending order.
8. Write a template based C++ program that implements selection sort algorithm to arrange a list of elements in descending order.
9. Write a template based C++ program that implements Quick sort algorithm to arrange a list of elements in ascending order.
10. Write a C++ program that implements Heap sort algorithm for sorting a list of integers in ascending order.
11. Write a C++ program that implements Merge sort algorithm for sorting a list of integers in ascending order.
12. Write a C++ program to implement all the functions of a dictionary (ADT) using hashing.
13. Write a C++ program that implements Radix sort algorithm for sorting a list of integers in ascending order.
14. Write a C++ program that uses functions to perform the following:
    a) Create a binary search tree ofintegers.
    b) Traverse the above Binary search tree non-recursively in ignored.
15. Write a C++ program that uses functions to perform the following:
    a) Create a binary search tree ofintegers.
    b) Search for an integer key in the above binary search tree non-recursively.
    c) Search for an integer key in the above binary search tree recursively.
16. Write a C++ program to implement hashing using any hash function.
17. Write a C++ program to implement extendible hashing.

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CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

B.Tech III Semester **L/T/P/C**
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PROBABILITY & ALGEBRA (CBSM6)

Course Objectives:

To learn:

1. Concepts of Basic probability.
2. Random variables that describe randomness or an uncertainty in certain realistic situation.
3. The study of discrete and continuous distributions predominantly describes important probability distributions.
4. To relate practical examples to the appropriate set, function or relation model, and interpret the associated operations and terminology in context.
5. Introduce the concepts of semi groups, monoids, groups, sub-groups, abelian groups, Isomorphism and homomorphism of groups.

Course Outcomes:

After learning the contents of this course the student must be able to
CO1: Learn the concept of basic probability to solve the real life problems.
CO 2: To solve problems on discrete and continuous random variables.
CO 3: Learn various discrete and continuous probability distribution and their properties.
CO4: Solve problems based on area properties of standard normal distribution.
CO5: Illustrate the basic terminology of functions, relations, sets, and demonstrate knowledge of their associated operations.
CO6: Understand the importance of algebraic properties with regard to working within various number systems.

UNIT I
Probability

Basic concepts of probability, Axiomatic definition of probability, Addition theorem , conditional probability, multiplication theorem, Independent events, Baye's theorem.

UNIT II
Random variables

Random variables –discrete and continuous, Mathematical expectation, Variance, co-variance, joint and marginal probability density function, statistical independence.

PROBABILITY & ALGEBRA (CBSM6)

UNIT III
Distributions

Probability mass function, density function of Binomial, Poisson and Normal distributions related properties.

UNIT IV
Relations

Properties of Binary relations, equivalence, transitive closure, compatibility and partial ordering Relations, Hasse diagram.
Functions: Inverse function, composition of functions, recursive functions.

UNIT V
Groups

Algebraic structures, examples and general properties, Semi groups and monoids, Groups, Sub groups, cosets and Lagranges theorem, homomorphism, and isomorphism of groups, cyclic groups, permutation groups.

Text Books:

1. Probability & Statistics for Engineers by G.S.S. Bhisma Rao, SciTech Publications.
2. Discrete Mathematics for Computer scientists & Mathematicians, J. L. Mott, A. Kandel, T.P.Baker.

Reference Books:

1. W.Feller- An introduction to probability theory and its applications- Vol.1- 3rd edition Wiley-1968.
2. Probability & Statistics for Engineers, Millers and John E. Freund, Prentice Hall of India.
3. Discrete mathematical structures theory and applications- malik & Sen Cengage.

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CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

B.Tech IV Semester **L/T/P/C**
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INTRODUCTION TO COMPUTER VISION (C74PC1)

Course Objectives:

To study the image fundamentals and mathematical transforms necessary for computer vision.

Course Outcomes:

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

1. Review the fundamental concepts of a image Model, Acquisition and Presentation.
2. Perform Statistical operations and Spatial Transformations on Digital image.
3. Understand the Segmentation and Edge detection concept and algorithms.
4. Apply the methods for regions identification and pattern recognition.
5. Understand the basic concepts of compression.

UNIT I

The Image Model: Introduction, Image Shape, Color Standards, The Human Vision System.
Image Acquisition: Introduction, Intensity Images, Real-time Capture, DVD and Video Disks, Color Images, Range Images, The Video Camera, Capture, Scanners, Satellite Imagery, Ranging Devices, Calibration.
Image Presentation: Introduction, Raster Screen, Printers, 3D-Imaging, Colour for Enhancing Monochrome Output, Multi-Spectral Rendition, Image Processors.

UNIT II

Statistical Operations: Introduction, Grey-level Transformations, Thresholding Errors, Color Thresholding, Histogram Equalisation, Multi-Image Operations.
Spatial Operations and Transformations: Introduction, Spatially Dependent Transformations, Templates and Convolution, Common Templates, Colour Convolution, Storing the Convolution Results, Other Window Operations, Interest Points, Correlation, 2D Geometric Transformations, Morphing and Warping and Fading.

UNIT III

Segmentation and Edge Detection: Introduction, Region Operations Merging, Splitting, Basic Edge Detection, Templates for Edge Detection, Second Order Edge Detection, Pyramid Edge Detection, Pyramid Edge Detection, Crack Edge Relaxation, Edge Following, Canny Edge Detection.
Morphological and Other Area Operations: Introduction, Basic Morphological Operations, Opening and Closing Operations, Area Operations.
Finding Basic Shapes: Introduction, Combining Edges, Hough Transforms, Bresenham's Algorithm.

INTRODUCTION TO COMPUTER VISION (C74PC1)

UNIT IV

Labeling Lines and Regions: Introduction, Flat Surface and Straight Edge Labeling, Dealing with Curves, Labeling Regions Reasoning.
Facts and Inferences: Introduction, Facts and Rules, Strategic Learning, Networks as Spatial Descriptors. **Rule Orders Pattern Recognition and Training**: Introduction, Approaches to the Decision-making Process, Decision Functions, Determining the Decision Functions, non-linear Decision Functions, Optical Character Recognition.

UNIT V

Image Compression: Introduction, Types and Requirements, Statistical Compression, Run Length Encoding, Sequence Encoding, Contour Coding, Changing the Domain, Quantising Compression, Fractal Compression, Real-time Image Transmission, Block Matching, Quad-trees, Image Standards.
Applications: Introduction, Some Application Sketches.

Text Book:

1. Introductory Computer Vision Imaging Techniques and Solutions 2nd Edition, Andrian Low, BS Publications.

Reference Book:

1. Digital Image Processing 3rd Edition, Rafael C.Gonzalez, Richard E. Woods.

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CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

B.Tech IV Semester **L/T/P/C**
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SOFTWARE ENGINEERING (C74PC2)

Course Objective:

To apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

Course Outcomes:

After completion of course the student will be able to

1. Understanding of the basic knowledge, analysis and design of complex systems.
2. Identify the minimum requirements for the development of application (Prototype).
3. Understand the objective of designing required process models and architectural styles.
4. Apply the process of validation and verification for a developed application.
5. Understand the process of deploying the quality and risk management for a developed application (Prototype).

UNIT I
Introduction to Software Engineering

The evolving role of software, Changing Nature of Software, legacy software, software myths.
Generic View of Process Software engineering- A layered technology, a process framework, the Capability Maturity Model Integration (CMMI), process patterns, process assessment, personal and team process models.
Process Models
The Waterfall Model, Incremental Process Model, Evolutionary Process models, specialized process models, unified process.

UNIT II
Software Requirements

Functional and Non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. Requirements Engineering Process Feasibility studies, Requirements elicitation and analysis, requirements validation, requirements management.
System Models-Context Models, Behavioral Models, Data Models, Object Models, structured methods.

UNIT III
Design Engineering

Design Process and Design quality, Design concepts, the design model, pattern based software Design, Creating an Architectural Design, Software architecture, Data Design, Architectural styles and patterns. Architectural Design, assessing alternative architectural designs, mapping data flow into software architecture. Modeling Component-Level Design, Design class-based components, conducting component-level design, object constraint language, design conventional components.

SOFTWARE ENGINEERING (C74PC2)

UNIT IV
Testing Strategies

A strategic approach to software testing, testing strategies for conventional software, Black-Box and White-Box testing. Validation testing, system testing, the art of debugging.
Product Metrics
Software Quality, Frame work for Product metrics, Metric for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance. Metrics for Process and Products Software Measurement, Metrics for Software Quality.

UNIT V
Risk Management

Reactive versus Proactive, Risk strategies, software risks, Risk identification, Risk projection, Risk refinement. RMMM, RMMM plan.

Text Books:

1. Software engineering A Practitioner's approach, Roger S Pressman, Sixth Edition McGrawHill International Edition.
2. Software Engineering: Ian Sommer ville, Seventh Edition, Pearson Education.

Reference Books:

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India 2010.
2. Software Engineering: A Primer, Waman S. Jawadekar, Tata McGraw Hill, 2008.
3. Software Engineering Foundations, Yingxu Wang, Auerbach Publications 2008.

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CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

B.Tech IV Semester **L/T/P/C**
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DESIGN AND ANALYSIS OF ALGORITHMS (C74PC3)

Course Objective:

To understand the design paradigms for developing an algorithm and analyzing it for a given problem.

Course Outcomes:

1. Argue the correctness of algorithms using inductive proofs and invariants.
2. Apply important algorithmic design paradigms and methods of analysis.
3. Synthesize efficient algorithms in common engineering design situations such as the greedy, divide and conquer, dynamic programming, backtracking and branch-bound.
4. Explain the different ways to analyze randomized algorithms (expected running time, probability of error)
5. Differentiate between tractable and intractable problems.

UNIT I
Introduction

Algorithm definition, Algorithm Specification, Performance Analysis-Space complexity, Time complexity, Randomized Algorithms. Divide and conquer- General method, applications – Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication.

UNIT II
Disjoint Set Operations

Disjoint set operations, union and find algorithms, AND/OR graphs, Connected Components and Spanning trees, Bi-connected components Backtracking-General method, applications the 8-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT III
Greedy Method

General method, applications- Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem.

UNIT IV
Dynamic Programming

General Method, applications- Chained matrix multiplication, All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack problem, Reliability design, Travelling sales person problem.

DESIGN AND ANALYSIS OF ALGORITHMS (C74PC3)

UNIT V
Branch and Bound

General Method, applications-0/1 Knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution, Traveling sales person problem. NP-Hard and NP Complete problems- Basic concepts, Non-deterministic algorithms, NP – Hard and NP-Complete classes, Cook's theorem.

Text Book:

1. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni and S.Rajasekharan, Universities Press.
2. Design and Analysis of Algorithms, P. H. Dave, H. B. Dave, 2nd edition, Pearson Education.

Reference Books:

1. Algorithm Design: Foundations, Analysis and Internet examples, M. T. Goodrich and R. Tomassia, John Wiley and sons.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford Univ. Press
3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson Education.
4. Foundations of Algorithms, R. Neapolitan and K. Naimipour, 4th edition, Jones and Bartlett Student edition.
5. Introduction to Algorithms, 3rd Edition, T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, PHI.

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CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

B.Tech IV Semester **L/T/P/C**
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FORMAL LANGUAGES & AUTOMATA THEORY (C74PC4)

Course Objective:

To provide introduction to some of the central ideas of theoretical computer science from the perspective of formal languages.

Course Outcomes:

After completion of the course, the student will be able to

1. Understand the concept of abstract machines and build up the ability to recognize the formal languages.
2. Employ finite state machines for modeling and solving computing problems.
3. Design context free grammars for formal languages.
4. Normalizing the context Free Grammar and design Turing Machines.
5. Distinguish between decidability and intractable problems.

UNIT I
Introduction

Introduction to Finite Automata, Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.
Deterministic Finite Automata, Nondeterministic Finite Automata, an application: Text Search,
Finite Automata with Epsilon-Transitions, Finite automata with output Epsilon Mealy and Moore machines, Equivalence of Mealy and Moore machines.

UNIT II
Regular Expressions

Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Automata and Regular expressions, Converting DFA's to Regular Expressions, Converting Regular Expressions to DFA, Properties of Regular Languages-Pumping Lemma for Regular Languages, Applications of the Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

UNIT III
Context-Free Grammars

Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

Push Down Automata:

Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata, non-deterministic pushdown automata, power of Deterministic Pushdown Automata and Non-Deterministic Pushdown Automata.

FORMAL LANGUAGES & AUTOMATA THEORY (C74PC4)

UNIT IV
Normal Forms for Context- Free Grammars

The Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages. Decision Properties of CFL's - Complexity of Converting among CFG's and PDA's, Running time of conversions to Chomsky Normal Form. Introduction to Turing Machines: Problems That Computers Cannot Solve, The Turing Machine, Programming Techniques for Turing Machines, Extensions to the basic Turing machine, Restricted Turing Machines, Turing Machines, and Computers.

UNIT V
Undesirability

A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Post's Correspondence Problem, Other Undecidable Problems, Intractable Problems: Polynomial time and space, Some NP-complete problems, The Classes P and NP, NP-Complete Problem.

Text Book:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.

Reference Books:

1. Introduction to Languages and the Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
5. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd edition, PHI.

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R PROGRAMMING (C74PC5)

Course Objective:

Gain knowledge on statistical data manipulation and analysis.

Course Outcomes:

After competition of this course, the students will be able to

1. Understand the basic functions of R and Create vectors in R.
2. Gain knowledge on creation of matrices and arrays in R.
3. Gain knowledge on creation of Factors and Data frames in R.
4. Understand and implement the searching and sorting techniques in R. and the file concepts in R.
5. Automate analyses and create new functions that extend the existing language features, incorporates features found in object-oriented and functional programming languages.

UNIT I
Introduction to R

Introduction, Functions, Preview of Some Important R Data Structures, Regression Analysis of Exam Grades, Startup and Shutdown, Getting Help, The help() Function, The example() Function. Vectors, Scalars, Vectors, Arrays, and Matrices, Declarations, Common Vector Operations, Using all() and any(), Vectorized Operations, NA and NULL Values, Filtering, Vectorized if-then-else.

UNIT II
Matrices and Arrays

Creating Matrices, General Matrix Operations, Applying Functions to Matrix Rows and Columns, More on the Vector/Matrix Distinction, Avoiding Unintended Dimension Reduction, Naming Matrix Rows and Columns, Higher-Dimensional Arrays.
Lists: Creating Lists, General List Operations, Accessing List Components and Values Applying Functions to Lists, Recursive Lists.

UNIT III
Data Frames

Creating Data Frames, Other Matrix-Like Operations, Merging Data Frames, Applying Functions to Data Frames**.**
Factors and Tables: Factors and Levels, Common Functions Used with Factors, Working with Tables, Other Factor-and Table-Related Functions.

R PROGRAMMING (C74PC5)

UNIT IV
R Programming Structures

Control Statements, Arithmetic and Boolean Operators and Values, Default Values for Arguments, Return values, Functions Are Objects, Environment and Scope Issues, No Pointers in R, Writing Upstairs, Recursion, Replacement Functions, Anonymous Functions.
Math and Simulations in R: Math Functions, Functions for Statistical, Sorting, Set Operations.

UNIT V
Files

Accessing the Keyboard and Monitor, Reading and Writing Files, Accessing the Internet.
String Manipulation: String-Manipulation Functions.
Graphics: Creating Graphs, Customizing Graphs.

Text Books:

1. The Art of R Programming by Norman Matloff-No Starch Press.

Reference Books:

1. R Programming for Bioinformatics by Robert Gentleman—CRC Press.
2. Data Analytics using R by Seema Acharya-TMH.
3. Hands-On Programming with R by Grrett Grolemund-OREILLY.
4. Beginners guide for Data Analytics using R by Jeeva Jose-Khanna Publications.
5. R for Beginners by Sandip Bakshit-TMH.

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CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

B.Tech IV Semester **L/T/P/C**
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SCRIPTING LANGUAGES LAB (C74PC6)

Course Objective:

To implement different applications using PHP,RUBY and Perl in real time applications

Course Outcomes:

After completion of course, the student will be able to

1. Write the PHP scripts and execute in Server Environment
2. Write the RUBY scripts and execute
3. Write the Perl scripts and execute

List of Experiments to be performed during the Course

1. Write the code to demonstrate basic HTML tags.
2. Write an HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, words and lines in the text entered using an alert message. Words are separated with white space and lines are separated with new line character.
3. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
4. Write a PHP script to demonstrate Variables and Data Types.
5. Write a PHP Script to demonstrate all Conditional Statements.
6. Write a PHP script to demonstrate all Control Statements.
7. Write a PHP script to demonstrate export a file into server.
8. Write a PHP script to demonstrate read excel file and display the contents.
9. Write a PHP script to demonstrate data base operations.
10. A web application takes a name as input and on submit it shows a hello page where is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You message with the duration of usage (hint: Use session to store name and time).
11. Demonstrate all arithmetic and logical operations in RUBY.
12. Demonstrate all Conditional and Control Structures in RUBY.
13. Demonstrate built in functions in RUBY.
14. Demonstrate all arithmetic and logical operations in Perl.
15. Demonstrate all Conditional and Control Structures in Perl.
16. Demonstrate built in functions in Perl.
17. Demonstrate construction of a Histogram for an Image.
18. Demonstrate 2D Transformations on Images.
19. Demonstrate Run Length Coding Algorithm.
20. Demonstrate any Statistical Compression Method.

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CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

B.Tech IV Semester **L/T/P/C**
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R PROGRAMMING LAB (C74PC7)

Course Objectives:

This course takes you from having no previous experience in programming to an intermediate level in R. You will learn the basic toolkit of the data-oriented professional, and learn where and how to learn more advanced skills when needed.

Course Outcomes:

At the end of this course, student will have all the computational tools to:

1. Implement empirical economic analyses.
2. Participate in online data science challenges.
3. Learn on your own further R, or other programming languages.

List of Programs:

1. R and R studio set-up.
2. R types, vectors and writing functions.
3. More R types, vectorization and efficient R code.
4. Importing data, time series data and Google Trends.
5. A data science project – a first look.
6. Data manipulation with tidyr.
7. Plotting with ggplot2.
8. R style guide, git integration, projects in R Studio.
9. Maps, plots and Amazon’s choice for a next office building.
10. 10.A data science project – more advanced.