LESSON PLAN

MCA First Semester

CIME
BHUBANESWAR
उद्यमेन ही सिध्यन्ति

COLLEGE OF IT AND MANAGEMENT EDUCATION

(A Constituent College of Biju Patnaik University of Technology, Rourkela)

MCBS1001
DISCRETE MATHEMATICS (3-0-0)

Faculty Name : Pranab Kumar Mohanty

Credit : 3
Credit Hour: 36

Course Objectives:

- To learn the mathematical foundations required for computer science.
- This course will help in understanding other courses in computer science.

Learning Outcomes:

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

CO1: Define & describe various logical connectives and expressions along with rules of inferences.
CO2: Apply various methods of proofs and proof strategies.
CO3: Learn the concepts of function and develop the various algorithms and its complexity.
CO4: Model counting techniques using recurrence relations & generating functions for applications.
CO5: Develop the concepts and applications of graphs in various computer science problems

Syllabus

UNIT-1: Logic and Proofs: Propositional logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs. Sets: Venn Diagrams, Subsets, The size of a set, Power Sets, Cartesian Products, Set Operations.

UNIT-2: Functions: One-to-One and Onto Functions, Inverse Functions and Compositions of Functions Partial Functions. Sequences and Summations. Algorithms, Searching Algorithms: Linear Search, Binary Search, Sorting: Bubble Sort, Insertion Sort, The Growth of Functions, Complexity of Algorithms.

UNIT-3: Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Recurrence Relations.
Relations: Relations and their Properties, n-ary Relations and their Applications, Representing Relations, Closure of Relations, Equivalence Relations, Partial Orderings.

UNIT-4: Graphs: Graph Terminology and Special Types of Graphs, Bipartite Graphs, Representing Graphs: Isomorphism of Graphs, Euler and Hamilton Paths, Shortest Path Problems: Dijkstra's Algorithm, Traveling Salesperson Problem, Planar Graphs, Graph Coloring. Trees: Tree Traversal, Minimum Spanning Trees.

Text Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Mc Graw Hills International
2. C. L. Liu, "Elements of Discrete Mathematics", McGraw Hills International Second Edition.

Reference Books:

1. Elements of Discrete Mathematics by C. L. Liu and D.P. Mohapatra, TMH, 2012
2. J. P Tremblay, R. Manohar, "Discrete Mathematical Structures with Applicatio
3. ns to Computer Science", TMH, 1997.

LESSON PLAN

Sl	Topic	Session	Pedagogy
	Module I		
1	Logic and Proofs.	1	Define & describe various logical connectives and expressions along with rules of Inferences.
2	Propositional logic.	1	Define & describe various logical connectives
3	Propositional Equivalences.	1	Define & describe various logical connectives and expressions along with rules of Inferences.
4	Predicates and Quantifiers, Nested Quantifiers.	1	Define & describe various logical connectives and expressions along with rules of Inferences.
5	Rules of Inference, Introduction to Proofs	1	Apply various methods of proofs and proof strategies.
6	Sets: Venn Diagrams, Subsets	1	Apply various methods of proofs and proof strategies.
7	The size of a set, Power Sets	1	Apply various methods of proofs and proof strategies.
8	Cartesian Products	1	Apply various methods of proofs and proof strategies.
9	Set Operations	1	Apply various methods of proofs and proof strategies.
	Module II		
10	Functions: One-to-One and Onto Functions	1	Learn the concepts of function
11	Inverse Functions and Compositions of Functions Partial Functions	1	Learn the concepts of function
12	Sequences and Summations	1	Develop various algorithms and its Complexity.
13	Algorithms	1	Develop the various algorithms and its Complexity.
14	Searching Algorithms	1	Develop the various algorithms and its Complexity.
15	Linear Search, Binary Search	1	develop the various algorithms and its Complexity.

16	Sorting: Bubble Sort Insertion Sort,	1	develop the various algorithms and its Complexity.
17	Sorting: Bubble Sort Insertion Sort,	1	develop the various algorithms and its Complexity.
18	The Growth of Functions, Complexity of Algorithms	1	develop the various algorithms and its Complexity.
Module III			
19	Counting: The Basics of Counting	1	Model counting techniques
20	The Pigeonhole Principle	1	Model counting techniques using recurrence relations Applications.
21	Permutations and Combinations	1	Model counting techniques
22	Binomial Coefficients	1	Model counting techniques
23	Recurrence Relations	1	Model counting techniques using recurrence relations& generating functions Applications.
24	Relations: Relations and their Properties	1	develop the various algorithms and its Complexity.
25	n-ary Relations and their Applications	1	develop the various algorithms and its Complexity.
26	Representing Relations, Closure of Relations	1	develop the various algorithms and its Complexity.
27	Equivalence Relations, Partial Orderings	1	develop the various algorithms and its Complexity.
Module IV			
28	Graphs: Graph Terminology	1	Develop the concepts and applications of graphs
29	Special Types of Graphs	1	Develop the concepts and applications of graphs
30	Bipartite Graphs, Representing Graphs: Isomorphism of Graphs	1	Develop the concepts and applications of graphs
31	Euler and Hamilton Paths	1	Develop the concepts and applications of graphs
32	Shortest Path Problems: Dijkstra’s Algorithm	1	Applications of graphs in various computer science problems
33	Traveling Salesperson Problem, Planar Graphs	1	Applications of graphs in various computer science problems
34	Graph Coloring. Trees: Tree Traversal	1	Applications of graphs in various computer science problems
35	Minimum Spanning Trees	1	Applications of graphs in various computer science problems
36	Overall question discussion	1	Applications of graphs in various computer science problems

MCPC1001
DIGITAL LOGIC DESIGN(3-0-0)

Faculty : Nihar Ranjan Sabat

Credit : 3
Credit Hour: 36

Course Objectives :

- To introduce the fundamental concepts of digital logic and Boolean algebra.
- To develop and understanding of combinational and sequential logic circuits.
- To explore advanced topics such as memory elements, state machines, and programmable logic devices.

Course Outcomes: Upon successful completion of this course, students should be able to:
CO1: Analyze and design combinational logic circuits using Boolean algebra and Karnaugh maps.
CO2: Design and implement sequential logic circuits, including flip-flops, counters, and registers.
CO3: Apply knowledge of digital logic to solve real-world engineering problems.

Syllabus

Unit 1: Binary Systems: Digital Computers and Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Boolean Algebra and Logic Gates: Boolean functions, Logic Operators, digital Logic Gates, Simplification of Boolean functions: Two and Three Variable Maps, Four Variable Map, Five Variable Map, Product of Sums Simplification, NAND and NOR Implementation, Don't Care Conditions.

Unit 2: Combinational Logic: Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive OR Functions, Binary Adder and Subtractor, Decimal Adder, Magnitude Comparator, Decoders and Encoders, Multiplexers, Programmable Logic Array (PLA), Programmable Array Logic (PAL).

Unit 3: Flip-Flops: RS Flip-Flop, D Flip-Flop, JK and T Flip-Flops, Triggering of Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Design Procedure, Design of Counters, Registers, Shift Register, Ripple Counters, Synchronous Counters, Timing Sequences, Random-Access Memory (RAM)

Unit 4: Semiconductor RAM Memories: Internal Organization of Memory Chips, Static Memories, Dynamic RAMs, Read-only Memories: ROM, PROM, EPROM, EEPROM, Flash Memory, Direct Memory Access, Memory Hierarchy, Cache Memory, Virtual Memory, Secondary Storage: Magnetic Hard Disks, Optical Disks, Magnetic Tape Systems
Memory elements: SRAM, DRAM, ROM, Programmable logic arrays (PLAs) and field-programmable gate arrays (FPGAs), Introduction to hardware description languages (HDLs) such as Verilog or VHDL, Introduction to digital simulation tools

Text Books:

1. "Digital Design" by M. Morris Mano and Michael D. Ciletti
2. "Fundamentals of Digital Logic with Verilog Design" by Stephen Brown and Zvonko Vranesic
3. "Computer Organisation and Embedded Systems" by Carl Hamacher, Z Vranesic, S Zaky and N Manjikian

Reference Books:

1. "Digital Systems: Principles and Applications" by Ronald J. Tocci, Neal S. Widmer, and Greg Moss
2. "Introduction to Logic Design" by Alan B. Marcovitz

LESSON PLAN

Sl. No	Topic	Session	Pedagogy
Module I			
1	Introduction to Digital Computers and Digital Systems, Binary Numbers	1	Lecture, Presentation
2	Number Base Conversions	1	Blackboard demonstration, Problem solving
3	Complements and Signed Binary Numbers	1	Digital Circuit Simulator demonstration, Group exercise
4	Boolean Algebra: Postulates, Theorems and Logic Operators	1	Lecture, Mathematical derivation
5	Digital Logic Gates: AND, OR, NOT, NAND, NOR, XOR	1	Interactive demonstration, Truth tables
6	Two and Three Variable K-maps	1	Step-by-step solution, Group exercise
7	Four and Five Variable K-maps	1	Problem solving, Practice exercises
8	Product of Sums, NAND/NOR Implementation, Don't Care Conditions	1	Circuit design, Practical examples
9	Module Review and doubt clearing session	1	Question-answer, Problem discussion
Module II			
10	Combinational Logic Design Procedure, Adders and Subtractors	1	Lecture, Circuit design
11	Binary Adder-Subtractor, Code Conversion, Analysis Procedure	1	Digital Circuit Simulator demonstration, Problem solving
12	Multilevel NAND/NOR Circuits, Exclusive OR Functions	1	Circuit conversion, Applications
13	Decimal Adder, Magnitude Comparator	1	Design examples, Implementation
14	Decoders, Encoders and Multiplexers	1	Circuit analysis, Function implementation
15	Programmable Logic Array (PLA) and Programmable Array Logic (PAL)	1	Structure analysis, Programming
16	Module Review and doubt clearing session	1	Student-centric, Problem solving
Module III			
17	Flip-Flops: RS, D, JK and T Flip-Flops	1	Lecture, Truth table analysis

18	Triggering of Flip-Flops and Analysis of Sequential Circuits	1	Timing diagrams, State analysis
19	State Reduction, Assignment and Design Procedure	1	Optimization techniques, Methodology
20	Design of Counters: Ripple and Synchronous Counters	1	Circuit design, Timing analysis
21	Registers, Shift Registers and Timing Sequences	1	Parallel/serial operations, Applications
22	Random-Access Memory basics	1	Memory organization, R/W operations
23	Module Review and doubt clearing session	1	Question-answer, Problem discussion
Module IV			
24	Semiconductor RAM: Internal Organization, Static and Dynamic RAMs	1	Memory architecture, SRAM vs DRAM
25	Read-only Memories: ROM, PROM, EPROM, EEPROM	1	Non-volatile memory, Programming
26	Flash Memory, Direct Memory Access	1	Modern memory, Data transfer
27	Memory Hierarchy, Cache Memory and Virtual Memory	1	Performance optimization, Address translation
28	Secondary Storage: Magnetic Hard Disks, Optical Disks, Tape Systems	1	Storage technologies, Characteristics
29	Memory Elements:	1	Comparative study, Applications
30	Programmable Logic Arrays (PLAs) and FPGAs	1	Advanced programmable logic
31	Introduction to Hardware Description Languages (Verilog/VHDL)	1	HDL basics, Syntax introduction
32	Introduction to Digital Simulation Tools	1	CAD tools, Simulation techniques
33	Module Review and doubt clearing	1	Student-centric discussion
34	Comprehensive Review- Module I& II	1	Problem solving, Concept reinforcement
35	Comprehensive Review-Module III& IV	1	Circuit analysis, Design problems
36	Final Review and Course Wrap-up	1	Comprehensive review, Exam preparation

MCPC1002
COMPUTER NETWORKS(3-0-0)

Faculty : Bishnupriya Mallick

Credit : 3

Credit Hour: 36

Course Objective:

1. Introduce students to the architecture, standards, and protocols of computer networks.
2. Provide an understanding of the functionalities of various network layers, including physical, data link, network, transport, and application layers.
3. Discuss the principles of routing, addressing, and internetworking in modern network environments.
4. Familiarize students with network applications, standard protocols, and techniques for ensuring quality of service and congestion control.

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

1. Explain the architecture and functioning of different network layers and their associated protocols.
2. Compare the OSI and TCP/IP reference models and understand their application in real-world networks.
3. Implement and troubleshoot data link layer protocols and error detection/correction methods.
4. Design and manage network systems using appropriate hardware and software tools, including IP addressing and routing protocols.
5. Utilize and manage network applications and protocols such as HTTP, FTP, email, TELNET, and DNS effectively.

Syllabus

Module-I: Overview of the Internet: introduction to data communication, network application, Network hardware, Protocol, Layering Scenario, reference models: The OSI Model, TCP/ IP model, Internet history, standards and administration; Comparison of the OSI and TCP/ IP reference model. Physical Layer: data and signals: analog and digital, periodic analog signals, digital signals, transmission impairments, data rate limit, Guided transmission media, unguided transmission media, Wireless transmission, mobile telephone system.

Module–II: Data Link Layer: Design issues, error detection and correction design issues, elementary data link protocols, CRC codes, sliding window protocols, HDLC, the data link layer in the internet. Elementary Data Link Layer Protocols, sliding window protocols, noisy and noiseless channels. THE MEDIUM ACCESS SUBLAYER: Channel allocations problem, multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless, Bluetooth.

Module–III : Connecting devices: learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways, definition of multiplexing and types. Network Layer: Network Layer Design issues, store and forward packet switching, connectionless and connection oriented networks-routing algorithms-optimality principle, circuit and packet switching, definition of flooding and multicast.

Module– IV : Routing protocols: Shortest Path, Routing uni-cast Distance Vector Routing, RIP, link state protocols, path vector routing. Internetworking: logical addressing, internet protocols, IP address, CIDR, IPv4 addressing, IPv6 Protocol addressing, addresses mapping, ICMP, IGMP,ARP,RARP, DHCP.

Module-V : Transport Protocols: process to process delivery, UDP, TCP, TCP Sliding Window, TCP Congestion Control, congestion control and quality of service. Application Layer-World Wide Web, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS.

Text Books:

1. "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross.
2. "Data Communications and Networking" by Behrouz A. Forouzan.

References:

1. Computer networks by Tanenbaum, A.S., Pearson Education India.
2. Computer Networks by Bhushan Trivedi, Oxford University Press

LESSON PLAN

Sl	TOPIC	Session	Pedagogy
	MODULE-I (7 HOURS)		
1.	Overview of the Internet: introduction to data communication, network application, Network hardware, Protocol, Layering Scenario	1	Lecture with demonstration
2.	Reference models: The OSI Model	1	Lecture with demonstration
3.	TCP/ IP model, Internet history, standards and administration; Comparison of the OSI and TCP/ IP reference model.	1	Lecture with demonstration
4.	Physical Layer: data and signals: analog and digital, periodic analog signals, digital signals	1	Lecture with demonstration, Problem solving
5.	Transmission impairments, Data rate limit	1	Lecture, demonstration, Problem solving
6.	Guided transmission media, unguided transmission media	1	Lecture with demonstration
7.	Wireless transmission, Mobile telephone system	1	Lecture with demonstration
	MODULE-II (10 HOURS)		
1.	Data Link Layer: Design issues, error detection and correction design issues	1	Lecture with demonstration, Problem solving
2.	Elementary data link protocols	2	Lecture with demonstration
3.	Noisy and noiseless channels, Sliding window protocols	2	Lecture with demonstration
4.	The medium access sub layer: Channel allocations problem, Multiple access protocols	2	Lecture with demonstration
5.	Ethernet, Wireless LAN	2	Lecture with demonstration
6.	Broadband Wireless, Bluetooth	1	Lecture with demonstration
	MODULE-III (7 HOURS)		
7.	Connecting devices: learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways	1	Lecture with demonstration
8.	Definition of multiplexing and types	2	Lecture, demonstration, Problem solving
9.	Network Layer: Network Layer Design issues, store and forward packet switching, Connectionless and connection oriented networks	2	Lecture with demonstration

10	Circuit and packet switching	1	Lecture with demonstration
11	Definition of flooding and multicast, Routing algorithms	1	Lecture with demonstration
MODULE-IV (8 HOURS)			
12	Routing protocols: Shortest Path, Routing unicast Distance Vector Routing	1	Lecture with demonstration
13	RIP, link state protocols, Path vector routing	1	Lecture with demonstration
14	Internetworking: logical addressing, IP address, CIDR,	1	Lecture with demonstration
15	IPv4 addressing	1	Lecture, demonstration, Problem solving
16	IPv6 Protocol addressing	2	Lecture, demonstration, Problem solving
17	Addresses mapping: ARP,RARP, DHCP	1	Lecture with demonstration
18	ICMP, IGMP	1	Lecture with demonstration
MODULE-V (7 HOURS)			
19	Transport Protocols: process to process delivery, UDP, TCP	2	Lecture with demonstration
20	TCP Sliding Window, TCP Congestion Control	1	Lecture with demonstration
21	Congestion control and quality of service	1	Lecture with demonstration
22	Application Layer-WWW, Standard client-server application-FTP	1	Lecture with demonstration
23	HTTP, Electronic mail	1	Lecture with demonstration
24	TELNET, DNS	1	Lecture with demonstration

MCPC1003
PROGRAMMING FOR PROBLEM SOLVING(3-0-0)

Faculty: Dr. Sudhir Kumar Senapati

Credit : 3
Credit Hour: 36

Course Objectives :

- To provide an understanding of basic programming concepts using the C programming language.
- To develop problem-solving skills using C programming constructs.
- To introduce students to algorithmic thinking and program design techniques.
- To enable students to write, compile, and debug programs in C.

Course Outcomes (CO)

CO1 : Understand the fundamental concepts of programming using the C language.
CO2 : Develop problem-solving skills through the application of programming constructs in C.
CO3 : Design and implement functions and algorithms to solve complex problems.
CO4: Demonstrate proficiency in using pointers, arrays, and structures in C programming.
CO5 : Apply error handling and debugging techniques to identify and resolve programming errors.
CO6 : Utilize file handling mechanisms in C for input/output operations.
CO7: Appreciate the importance of data structures and their implementation in C.

Syllabus

Unit 1: Introduction to C Programming

Introduction to Problem Solving through programs, Flowcharts/Pseudo codes, the compilation process, Syntax and Semantic errors, Variables and Data Types, Arithmetic expressions, Relational Operations, Logical expressions; Conditional Branching and Iterative Loops.

Unit 2: Functions and Arrays

Introduction to Functions, Function Prototypes and Declarations, Parameter Passing in Functions, Recursion, Arrays: 2-D arrays, Character Arrays and Strings.

Unit 3: Pointers and Structures

Introduction to Pointers, Pointer Arithmetic, Dynamic Memory Allocation, Structures and Unions File Handling in C, Self-Referential Structures and Introduction to Lists.

Unit 4: Advanced Concepts in C

Preprocessor Directives, Command Line Arguments, Bitwise Operators, Error Handling and Debugging Techniques, Introduction to Data Structures in C.

Textbooks:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Reference Books:

1. "C Programming: A Modern Approach" by K.N. King
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
3. "Let Us C" by Yashavant Kanetkar"

LESSON PLAN

Sl	Topic	Session	Pedagogy
Module – I: Introduction to C Programming			
1	Introduction to Problem Solving through programs	1	Lecture with real-life examples
2	Flowcharts/Pseudo codes	1	lecture with discussion
3	The compilation process	1	Hands-on problem solving with examples
4	Syntax and Semantic errors	1	Demonstrations with examples
5	Variables and Data Types	1	lecture with suitable examples discussion
6	Arithmetic expressions & Relational Operations	1	Board work with solved examples
7	Logical expressions	1	Hands-on problem solving with examples
8	Conditional Branching	1	Board work With solved examples
9	Iterative Loops	1	Demonstrations with examples
Module – II : Functions and Arrays			
10	Introduction to Functions	1	lecture with discussion
11	Function Prototypes and Declarations	1	lecture with discussion
12	Parameter Passing in Functions	1	Demonstrations with Examples
13	Functions with Recursion	1	lecture with discussion
14	Arrays: 2-D arrays	1	Demonstration with board work
15	Arrays with multi-Dimension	1	Demonstrations with Examples
16	Character Arrays and Strings	1	lecture with discussion
17	Character Arrays and Strings	1	Demonstration with Examples

18	Revision of Functions and Arrays	1	Step-by-step examples
Module – III : Pointers and Structures			
19	Introduction to Pointers	1	lecture with discussion
20	Pointer Arithmetic	1	Discussion with examples
21	Dynamic Memory Allocation	1	Demonstration with board work
22	Structures and Unions	1	Demonstration with Examples
23	Revision of Structures and Unions	1	Discussion with examples
24	File Handling in C	1	Board Work with examples
25	Self-Referential Structures	1	Board Work with examples
26	Introduction to Lists	1	lecture with discussion
27	Revision of File & Structures and Lists	1	Demonstration with Examples
Module – IV: Advanced Concepts in C			
28	Pre-processor Directives	1	lecture with discussion
29	Command Line Arguments	1	Step-by-step example
30	Bitwise Operators	1	Diagram + explanation
31	Error Handling Techniques	1	Board diagram + coding demo
32	Different Debugging Techniques	1	Step-by-step explanation
33	Revision of Different Advanced Concepts in C	1	lecture with discussion
34	Introduction to Data Structures in C	1	Demonstration with Examples
35	Past University question paper discussion	1	lecture with discussion
36	**Revision & Mock Test**	1	Quiz, past question paper discussion

MCPC1004
DATABASE MANAGEMENT SYSTEMS(3-0-0)

Faculty Name: Mr. Deepak Ranjan Panda

Credit : 3
Credit Hour: 36

Course Objective:
This course provides fundamental and practical knowledge on database concepts by means of organizing the information, storing and retrieve the information in an efficient and a flexible way from a well-structured relational model. This course ensures that every student will gain experience in creating data models and database design and be able to do the followings.

- Focus the role of a database management system in an organization and construct ER Diagram.
- Demonstrate basic database concepts, including the structure and operation of the relational data model and basic database queries using SQL.
- Applying advanced database queries using Structured Query Language (SQL).
- Evaluating logical database design principles and database normalization.
- Demonstrate the concept of a database transaction, concurrency control, and data object locking and protocols.

Course Outcomes:
After successful completion of the course the student will be able to:
CO1: Understand database design principles.
CO2: Apply data Modelling using E-R diagrams.
CO3: Create refined data models using normalization.
CO4: Build database queries using Structured Query Language.
CO5: Understand the transaction management and concurrency control.

Syllabus

Module 1: Introduction to DBMS: File system vs. DBMS, advantages of DBMS, storage data, queries, DBMS structure, Types of Databases – Hierarchical, Network, Relational, Key-Value, Object Oriented, XML DB Overview of File Structures in database, 3-schema architecture of DBMS, data independence, EF Codd Rule.

Module 2: Data base Design: Data models, the importance of data models. E-R model: Entities, attributes and entity sets, relationship and relationship set, mapping cardinalities, keys, features of ER model, conceptual database design with ER model. Relational model: Integrity constraints over relations and enforcement, querying relation data, logical database design, views, destroying/altering tables and views, Relational algebra, Extended relational algebra Operations.

Module 3: Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, Reasoning about Functional Dependencies. Normal Forms, Properties of Decomposition, Normalization, different types of dependencies.

Module 4: Basic SQL: Introduction to SQL, Basic SQL Queries: DML, DDL, DCL, and TCL Structured Query Language (SQL): Select Commands, Union, Intersection, Except, Nested Queries, Aggregate Operators, Null values, Relational set operators, SQL join operators Relational Algebra (RA): Selection, Projection, Set operations, joins Relational Calculus (TRC, DRC): Tuple Relational Calculus, Domain Relational Calculus PL/SQL, Assertions, Triggers. Introduction to Transaction Management: ACID properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control. Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Concurrency control without locking. Crash Recovery: Aries, Recovering from a System Crash. Advanced Database: OODB, WEB based DB, Data warehousing and Data mining.

Textbooks:

1. H.F. Korth, A. Silverschatz, Abraham," Database system concepts", Tata McGraw Hill Publication, 6e, 2011
2. Raghu Ramakrishna and Johannes Gehrke, Database Management Systems, McGraw-Hill, 3e, 2014

References:

1. D. Ullman, Principles of Database and Knowledge – Base Systems, Vol. 1, 1/e, Computer Science Press, 1990.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education, 7e, 2016.
3. Er. Rajiv chopra, "Database management systems, A Practical Approach", S. Chand Publishing

LESSON PLAN

Sl	Topic	Session	Pedagogy
Module I			
1	Introduction to DBMS & File System vs. DBMS	1	Lecture and Discussion
2	Advantages of DBMS	1	Lecture and Case Study
3	Storing Data & Basic Queries	1	Lecture and Demonstration
4	DBMS Structure	1	Lecture and Diagrammatic Explanation
5	Types of Databases (Hierarchical, Network, Relational, Key-Value, Object-Oriented, XML DB)	1	Lecture ,Diagram and Examples
6	File Structures in Databases	1	Lecture, Diagrams, Performance Analysis
7	3-Schema Architecture & Data Independence	1	Lecture, Diagram and Activity (Mapping)
8	E.F. Codd's 12 Rules	1	Lecture and Discussion
Module II:			
9	Introduction to Database Design. Data Models and Their Importance	1	Lecture and Discussion
10	E-R model: Entities, Attributes and Entity Sets	1	Lecture and Diagrammatic Practise
11	Relationship and Relationship Set, Mapping Cardinalities, Keys	1	Lecture, Diagrams and Example Analysis
12	Features of ER model, Conceptual Database Design with ER model	1	Lecture and Case Study
13	Relational model: Integrity constraints over Relations and Enforcement	1	Lecture and Demonstration
14	Querying Relation Data, Logical Database Design, Views, Destroying/Altering Tables and Views	1	Lecture and Demonstration
15	Relational Algebra	1	Lecture and Problem Solving
16	Extended Relational Algebra Operations	1	Lecture and Practice Exercise
Module III			

17	Introduction to Schema Refinement ,Issues with Poor Schema Design (Redundancy, Anomalies))	1	Lecture, Example Analysis and Discussion
18	Functional Dependencies: Concepts and Definitions, Inference Rules	1	Lecture, Example Analysis and Proofs
19	Reasoning about Functional Dependencies :Closure, Equivalent Sets	1	Lecture, Problem Solving and Practice Exercise
20	Reasoning about Functional Dependencies :Minimal Cover	1	Lecture, Problem Serving, Discussion
21	Reasoning about Functional Dependencies : Finding Key(s)	1	Lecture, Problem Serving, Practise Exercise
22	Normal Forms: Introduction,1NF,2NF	1	Lecture, Examples and Activity
23	Normal Forms: 3NF and BCNF	1	Lecture and Case Study
24	Properties of Decomposition: Lossless-Join and Dependency Preservation	1	Lecture, Diagrammatic Explanation and Activity
25	Normalization :Decomposition into 2NF,3NF,BCNF	1	Lecture, Problem Solving and Practice Exercise
26	Different Types of Dependencies (MVD & 4NF,JD & 5NF)	1	Lecture and Discussion
Module IV:			
27	Introduction to SQL, Basic SQL Queries (DML, DDL, DCL, TCL)	1	Explanation and Demonstration
28	Select Commands, Union, Intersection, Except, Nested Queries and Aggregate Operator Null values,	1	Lecture, Writing Queries, Discussion on query use cases
29	SQL join operations	1	Lecture, Writing Queries using Joins, Practice Exercise
30	Relational Algebra (RA): Selection, Projection, Set operations	1	problem solving and activity converting RA to SQL
31	Relational Calculus (TRC, DRC)	1	Lecture, Discussion and Example, Practise Exercise
32	PL/SQL, Assertions, Triggers	1	Coding demo , Mini Project (Business Rule)
33	Introduction to Transaction Management: ACID properties, Transactions and Schedules, Concurrent Execution of Transactions	1	Lecture, Examples, Activity: Serializability Testing
34	Lock-Based Concurrency Control. Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions,	1	Lecture, Case based discussions
35	Dealing with Deadlocks, Concurrency control without Locking. Crash Recovery: Aries, Recovering from a System Crash.	1	Lecture, Case Study, Recovery Demonstration
36	Advanced Database: OODB, WEB based DB, Data warehousing and Data mining.	1	Seminar style: student presentations ,instructor led summary