SEMESTER V

3PCCCS301	**Database Management Systems**	**3L:0T:0P**	**3 Credits**

Objectives of the course

To understand the different issues involved in the design and implementation of a database system.

To study the physical and logical database designs, database modeling, relational, hierarchical, and network models

To understand and use data manipulation language to query, update, and manage a database

To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.

To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Detailed contents

Module 1

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Module 2:

Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Module 3:

Storage strategies: Indices, B-trees, hashing.

Module 4:

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Module 5:

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Module 6:

Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

Suggested books:

"Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

Suggested reference books

1 "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
2 "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education
3 "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

Course Outcomes

For a given query write relational algebra expressions for that query and optimize the developed expressions

For a given specification of the requirement design the databases using E-R method and normalization.

For a given specification construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.

For a given query optimize its execution using Query optimization algorithms

For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.

Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

3PCCCS302	**Formal Language & Automata Theory**	**3L:0T:0 P**	**3 Credits**

Objectives of the course

Develop a formal notation for strings, languages and machines.

Design finite automata to accept a set of strings of a language.

Prove that a given language is regular and apply the closure properties of languages.

Design context free grammars to generate strings from a context free language and convert them into normal forms.

Prove equivalence of languages accepted by Push Down Automata and languages generated by context free grammars

Identify the hierarchy of formal languages, grammars and machines.

Distinguish between computability and non-computability and Decidability and undecidability.

Detailed contents

Module 1:

Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages. Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages, minimization of finite automata. Context-free languages and pushdown automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs. Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG. Turing machines: The basic model for Turing machines (TM), Turing-recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators. Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

Suggested books

John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.

Suggested reference books:

Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.

Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.

Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.

John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill.

Course Outcomes:

Write a formal notation for strings, languages and machines.
Design finite automata to accept a set of strings of a language.
For a given language determine whether the given language is regular or not.
Design context free grammars to generate strings of context free language .
Determine equivalence of languages accepted by Push Down Automata and languages generated by context free grammars
Write the hierarchy of formal languages, grammars and machines.
Distinguish between computability and non-computability and Decidability and undecidability.

3PCCCS303	**Object Oriented Programming**	**2L:0T:0 P**	**2 Credits**

Objectives of the course

The course will introduce standard tools and techniques for software development, using object oriented approach, use of a version control system, an automated build process, an appropriate framework for automated unit and integration tests.

Detailed contents

Abstract data types and their specification.

How to implement an ADT. Concrete state space, concrete invariant, abstraction function. Implementing operations, illustrated by the Text example.

Features of object-oriented programming. Encapsulation, object identity, polymorphism – but not inheritance.

Inheritance in OO design.

Design patterns. Introduction and classification. The iterator pattern.

Model-view-controller pattern.

Commands as methods and as objects. *Implementing OO language features. Memory management.*

Generic types and collections

*GUIs. G*raphical programming with Scala and Swing *The software development process.*

The concepts should be practised using C++ and Java. Pearl may also be introduced wherever possible.

Suggested books

1. Barbara Liskov, *Program Development in Java*, Addison-Wesley, 2001

Suggested reference books

Any book on Core Java

Any book on C++

Course Outcomes

After taking the course, students will be able to:

Specify simple abstract data types and design implementations, using abstraction functions to document them.

Recognise features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.

Name and apply some common object-oriented design patterns and give examples of their use.

Design applications with an event-driven graphical user interface.

3PCCCS304	**IT Workshop (Sci Lab/MATLAB)**	**2L:0T:0P**	**2 Credits**

Objective:

This Lab Course will enable the students to understand the fundamentals and Programming knowledge in SCILAB.

INSTRUCTIONAL OBJECTIVES:

1. To learn the SCILAB environment and its programming fundamentals
2. Ability to write Programs using commands and functions
3. Able to handle polynomials, and use 2D Graphic commands

LIST OF EXPERIMENTS

1. Practicing SCILAB environment with simple exercises to familiarize Command Window, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts, Help files.
2. Data types, Constants and Variables, Character constants, operators, Assignment statements.
3. Control Structures: For loops, While, If control structures, Switch, Break, Continue statements.
4. Input-Output functions, Reading and Storing Data.
5. Vectors and Matrices, commands to operate on vectors and matrices, matrix Manipulations.
6. Arithmetic operations on Matrices, Relational operations on Matrices, Logical Operations on Matrices.
7. Polynomial Evaluation, Roots of Polynomial, Arithmetic operations on Polynomials.
8. Graphics: 2D plots, Printing labels, Grid & Axes box, Text in plot, Bar and Pie chart.

TEXT BOOK

1. Bansal R.K, Goel A.K., Sharma M.K., “MATLAB and its Applications in Engineering”, Pearson Education, 2012. REFERENCES
1. Amos Gilat,“MATLAB-An Introduction with Applications”, Wiley India, 2009.
2. Stephen.J.Chapman,“Programming in MATLAB for Engineers”, Cengage Learning, 201

3PCCCS305	**Operating Systems**	**3L:0T:3P**	**3 Credits**

Objectives of the course

To learn the fundamentals of Operating Systems.

To learn the mechanisms of OS to handle processes and threads and their communication
To learn the mechanisms involved in memory management in contemporary OS
To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
To know the components and management aspects of concurrency management
To learn to implement simple OS mechanisms

Detailed contents

Module 1:
Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.

Module 2:
Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching
Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,
Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

Module 3:
Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Module 4:
Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

Module 5:
Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.
Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC),

Not recently used (NRU) and Least Recently used (LRU).

Module 6:

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free- space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

Suggested books:

Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.

Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

Suggested reference books:

Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing

Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley

Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India

Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Course Outcomes

Create processes and threads.

Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.

For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.

Design and implement file management system.

For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

3PECCSD301	**Soft Computing**	**3L:0T:0P**	**3 Credits**

Module 1:
Data Fuzzy Set Theory:Basic Definition and Terminology, Set Theoretic Operations, MF
Formulation and Parameterization, MF of two dimension, Fuzzy Union, Intersection and
Complement. Fuzzy Rules and Fuzzy Reasoning: Extension Principles and Fuzzy Relations, Fuzzy IF THEN Rules, Fuzzy Reasoning

Module 2:
Fuzzy Inference System: Introduction, Mamdani Fuzzy Models, Other Variants, Sugeno Fuzzy Models, Tekamoto Fuzzy Models. GENETIC ALGORITHMS .Fundamentals of Genetic Algorithms: Basic Concepts Creation, Offsprings Encoding, Fitness functions, Reproduction, Genetic Modelling: Inheritance Operators, Cross over, Inversion and detection, Mutation operator, Bitwise operators.
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Module 3:
Introduction :Architecture, Back Propagation and feed Forward Networks, Offline Learning, Online Learning. Supervised Learning of Neural Networks: Introduction, Perceptrons, Adaline, Back Propagation Multilayer Perceptrons, Back Propagation Learning Rules.

Module 4:
Methods of Speeding :Radical Basis Function Networks, Functional Expansion Networks.
Unsupervised Learning: Competitive Learning Networks, Kohonen self- organising networks, Hebbian Learning, The Hopfield Network.

Suggested Books:
1. J.S.R. Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing" PHI/Pearson Education, New Delhi 2004.
2. S. Rajasekaran& G.A. VijayalakshmiPai, PHI, New Delhi 2003.
3. T. J. Ross, " Fuzzy Logic with Engineering Applications." TMH, New York, 1997.

Course Outcomes

To understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.

To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.

To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

HSMC301	**Professional Skills**	**2L:0T:0P**	**0 Credits**

COURSE OBJECTIVE-*The aim is to develop students' soft skills, communication, leadership and teamwork skills; and personal development skills using practical approach and exposure of students to the realities of the world.*

- *To enhance Leadership – assessing the requirements of a task, identifying the strengths/weaknesses within the team, utilising the diverse skills of the group to achieve the set objectives.*
- *To improve Communication – demonstrating clear briefing and listening /speaking skills.*
- *To make them realize that effective communication and interpersonal skills are crucial to increase employment opportunities and to compete successfully in the business environment.*
- *The course aims to cause a basic awareness about the significance of soft skills in professional and inter-personal communications and facilitate an all-round development of personality. Hard or technical skills help securing a basic position in one's life and career. But only soft skills can ensure a person retain it, climb*

Unit 1 : Personal Development

Managing Self - Self Discovery, Self Awareness, Self Esteem, Self Responsibility, Self Management

Personal Development Skills, Categories of Personal Development, Personal Development Process

Relationship Management - Managing Others, Interpersonal Skills, Improving Relationship, Transactional Analysis, JOHARI Window, four Life Positions

Unit II : Thinking Process

Strategic Thinking – Introduction, Concept, Stages in Strategic Thinking, Process of Strategic Thinking, Importance of Strategic Thinking, Characteristics of Strategic Thinkers, Developing Strategic Thinking
Lateral Thinking – Introduction, Meaning, Need for Lateral Thinking, Techniques of Lateral Thinking, Benefits of Lateral Thinking
Creative Thinking – Out of Box Thinking, Application of Thinking

Facing Changes – Adapting Change, Understanding Change- Examples of Organizational Change
Facing Challenges – Introduction, Taking Initiative, Benefits of facing challenges, Facing challenges in life
Balancing Work and Life – Importance, Gender differences regarding work life balance, Tips for balancing work and life

Unit III : Individual Behaviour

Attitude – Components of Attitude, Factors influencing Attitude, Types of Attitude, Challenges and lessons from Attitude, Impact of Attitude on Behaviour
Motivation – Concept, Objective, Factors of Motivation, Self Steem, Intrinsic & Extrinsic Motivation

Time Management – Value of Time, Diagnosing Time management, Weekly Planner, To Do List, Prioritizing Work
Stress Management – Introduction, Difference between Stress, Anxiety and Tension, Managing Stress
Applied Ethics – Introducing Professional Ethics, Ethical Dilemma

Unit IV : Employment Communication

Job Communication – Developing Job Communication Skills, Job Communication Process, Developing Confidence
Job Search Strategy – Understanding the Job Market, The Job Search Process, Job Search Techniques
Job Application, Employment Letters
Resume Building – Difference between Bio data, Curriculum Vitae and Resume

The Job Interview - Types of Job Interview, Preparing for a Job Interview, Understanding Interview Questions, Handling Interview Questions, Interview Strategies
Psychometric Test

Suggested Readings :

1. Covey S (2004) The 7 Habits of Highly Effective People.
2. Goud, N. & Arkoff, A. (2003) Psychology and Personal Growth, Allyn & Bacon.
3. Sen, Leena, Communication Skills, Eastern Economy Edition
4. Dr. K.Alex Managerial Skills, S.Chand

MC301	**Constitution of India**	**2L:0T:0P**	**0 Credits**

Programme Learning Outcome: The basic object of the course is to provide the acquaintance with the basic features of Indian Constitution e.g. Fundamental Rights, Fundamental Duties and Directive Principles of State policy Further it is aimed to impart the knowledge about Judicial system in India.

Unit-I 4 Hours

1. Nature of Indian Constitution
2. Preamble
3. Union and its Territory (Arts 1-4)
4. Citizenship (Arts 5-11)
5. Definition of State (Art 12)

Unit-II 6 Hours

1. Judicial Review (Article 13)
2. Right to Equality (Article 14)
3. Prohibition on grounds of Religion, Race, Caste, Sex, Place of Birth (Article 15)
4. Equality of Opportunity in Public Employment (Article 16)
5. Abolition of Untouchability and Titles (Articles 17-18)

Unit-III 6 Hours

1. Basic freedoms (Article 19)
2. Protection in respect of conviction for offences (Article 20)
3. Right to Life and Personal Liberty (Article 21)
4. Safeguards against arbitrary arrest and detention (Article 22)

Unit-IV 6 Hours

1. Right against exploitation (Articles 23-24)
2. Freedom of Religion (Articles 25-28)
3. Cultural and Educational Rights of Minorities (Articles 29-30)
4. Constitutional Remedies (Articles 32-35)

Unit-V 8 Hours

1. Directive Principles of State Policy and their relation with Fundamental Rights (Articles 36-51)
2. Fundamental Duties (Article 51-A)
3 Right to Property (Article 300-A)
4 Facts and Law laid down in Maneka Gandhi V Union of India AIR 1978 SC 597
5 Facts and Law laid down in Indira Sawhney V Union of India AIR 1993 SC 477

Books Recommended:

1. Austin Granville- The Indian constitution: Cornerstone of a Nation.
2. Seervai H.M. - Constitution of India
3. Jain M.P. – Indian Constitutional Law
4. Shukla V N- Constitution of India (ed. By M.P. Singh)
5. Basu D.D. – Shorter Constitution of India