FOURTH SEMESTER IT 2018-19 (PATTERN C-17)

CODE: MA21107 **REF NO: To be filled by CD office**

Probability and Statistics

Credits: 03 **Teaching Scheme: -** Theory 03 Hrs/Week

Prerequisites:

1. Elementary idea of differential and integral calculus, Permutations, Combinations and Binomial Theorems of 10+2 standard.

Objectives:

1. To introduce the fundamental concepts of probability and probability distributions.
2. To make students of aware some of the readily applied probability distributions such as Binomial Distribution, Poisson distribution, Normal distribution, Gama, Weibull distribution, Chi-Squared distributions, etc.
3. To make students aware of Sampling distributions such as *t* and *F* – Distributions and their applications in estimating the parameters such as mean and variance.
4. To introduce the concept of testing of hypothesis.
5. To make students aware of the concept of correlation and regression.
6. To introduce the concept of Stochastic Process

Course Details:

Unit 1: Title - Elementary Probability Theory and Random Variables: (08 Hrs)

U1.1 Probability: Introduction, Probability of an event, additive and multiplication rules, conditional probability, Bayes' rule, random variable, discrete and continuous probability distribution, Joint probability distribution, Mathematical expectation, Variance and co-variance of random variables, Mean and co-variance of linear combination of random variables, Chebyshev theorem. **[T_2]**

U1.2 Self Study Topics : Weak and Strong laws of Large Numbers.

Unit 2: Title - Some Probability Distributions: (08 Hrs)

U2.1 Binomial, Poisson, Uniform, Normal, Gamma, Exponential, Weibull and Chi-square distributions. Moments and Moment Generating functions of the above distributions. **[T_2]**

U2.2 Self Study Topics: Negative Binomial, Geometric, Hyper-geometric, and Beta Distributions

Unit 3: Title - Sampling Distributions and applications to Estimation of Parameters:

(08 Hrs)

U3.1. Sampling Distribution: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distributions of means, Sampling distribution of S^2, *t*- distribution, *F*-distribution. **[T2]**

Estimation of parameter: Methods of estimation, Estimating the mean and variance of a single sample, Standard error, Prediction intervals, Tolerance limits, Estimating the difference between means of two samples, Estimating proportion and variance of a single sample, Estimating the difference between two proportions and ratio of variances of two samples, Maximum likelihood estimation, Characteristics of a good estimator. **[T2]**

U3.2. Self Study Topics : Estimating a proportion of a single sample, Estimating the difference between two proportions of two Samples.

Unit 4: Title - Testing of Hypotheses, Linear Regression and Correlation (08 Hrs)

U4.1 Test of hypothesis: one and two tailed test, test on a single mean when variance is known & variance is unknown. Test on two means, tests on single and two proportions. One and two sample test for variance. **[T2]**

Introductory concepts of Correlation and Regression: Karl Pearson Coefficient of Correlation, Regression and Lines of Regression. **[T1]**

U4.2. Self Study Topics : Multiple Linear Regression.

Unit 5: Title - Stochastic Process (08 Hrs)

U5.1 Definition of Stochastic Process, The Poisson Process, Birth-and-Death Process, Markov Chains **[T3]**

U5.2. Self Study Topics : Renewal Theory.

Note: Five assignments to be given to the students on self study, comprising of one assignment from each unit.

Text Books:

T1. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand and Sons, 11th Revised Edition, 2002.

Chapters: 10 (101 – 10.4), 11(11.1, 11.2(11.2.1-11.2.3)).

T2. Probability & Statistics for Engineers & Scientists, Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, and Keying Ye, Pearson Education, Eight Edition, Third Impression, 2009.
Chapters 2, 3(3.1- 3.4), 4(4.1 - 4.4), 5 (5.3, 5.6), 6 (6.1 – 6.8, 6.10), 7(7.3), 8(8.1 –, 8.2, 8.4- 8.8), 9(9.3 – 9.8, 9.12, 9.13), 10 (10.2, 10.3, 10.5, 10.7, 10.8, 10.11 – 10.13).

T3. Probability Statistics and Queuing Theory with Computer Science Applications, Arnold Allen, Elsevier India Pvt. Ltd., New Delhi, 2nd Edition, 2005.
Chapters: 4, 7(7.1)

Reference Books:

R1. Probability and Statistics for Engineers, Jay L. Devore, Cengage Learning, India Edition, 2008.
R2. Statistics for Engineers and Scientists, William Navadi, Tata McGraw-Hill Publishing Company Limited, New Delhi, Second Edition, 2008.
R3. Probability and Statistical Inference, Robert V. Hogg, Elliot A. Tanis, Jagan Mohan Rao, Pearson Education, Seventh Edition, 2006.
R4. Probability, Statistics and Random Processess, T. Veerarajan, Tata McGraw-Hill Publishing Company Limited, New Delhi, Third Edition, 2008.
R5. Advanced. Engineering Mathematics, Erwin Kreyszig, John Willy and Sons, 8th Edition, 1999.
R6. Introduction to Probability and Statistics, William Mendenhall, Robert J. Beaver & Barbara M. Beaver, CENGAGE Learning India Pvt. Ltd., New Delhi, 13th Edition, 2009.
R7. An Introduction to Probability and Statistics, Vijay K. Rohatgi, A.K. Md. Ehsanes Saleh, John Wiley & Sons, INC., Second Edition, 2006.
R8. Probability and Statistics for Science and Engineering, G. Shankar Rao, Univeristy Press, 1st Edition, 2011.
R9. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 43rd Edition, 2014.

Course Outcomes:
After taking this course, the student should be able to –

1. Compute probabilities by modeling sample spaces and applying rules of permutations and combinations, additive and multiplicative laws and conditional probability
2. Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance
3. Compute probabilities based on practical situations using the binomial, Poisson, Gamma, Exponential, Weibull, Chi-Squared, and Normal distributions.
4. Use the normal distribution to test statistical hypotheses and to compute confidence intervals.
5. Apply sampling distributions in estimating statistical parameters.
6. Apply the concepts of Null and Alternative Hypothesis for testing hypotheses.
7. Apply the concepts of correlation, regression and method of least square.
8. Comprehend the Introductory concepts of the Stochastic Process

COURSE CODE: IT20132 **REF NO: To be filled by CD office**

Database Engineering

Credits: 3 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:
1. Computer Programming
2. Knowledge of Data Structures

Objectives:

To introduce database systems and learn the techniques of data modeling, database design, data retrieval and database management.

Course Details:

Unit 1: Title - Introduction to DBMS and ER Data Model **(7 Hrs)**

U1.1

Data Storage: File processing system, Disadvantages; DBMS: Need of DBMS, Terms: Data, Database, Metadata, Data Dictionary, Database System, Database Management System, Data Abstraction, Data Independence, System Architecture of DBMS, Data Model: Definition, ER and Relational Data Model, Object Oriented, Object Relational Models; ER Model: Entity, Entity Set, Attributes, Primary Key, Relationship, Types and Attributes of Relationship, Role, Cardinality Ratio, Participation Constraint, Weak Entity Set, EER Features.

U1.2

Self Study: Hierarchical and Network Data Models, Comparison of Different Data Models, Selection as 1. Entity Vs Attribute, 2. Entity Vs Relationship, 3. Binary Vs Ternary Relationship, Tools for Designing ER Model, Introduction of Popularly used Relational

Unit 2: Title - Relational Data Model **(7 Hrs)**

U2.1

Relational Data Model: Terms: Relation, Schema, Attributes, Tuples, Domains, Relation Degree (or Arity) and Cardinality, Relation Intention and Extension, Super Key, Candidate Key, Primary Key and Foreign Key, Relational Model Constraints, Schema Diagram, ER to Relation Mapping, Detailed storage architecture, Magnetic disk RAID Storage Access, File & Record Organization Indexing and order indices (B, B+ Tree).

U2.2

Self Study: Characteristics of Relation, Codd's Twelve Rules for Relational DBMS, Reverse Engineering: Relational Database into ER/ EER Model.

Unit 3: Title - Relational Algebra and Relational Calculus (8 Hrs)

U3.1

Relational Algebra and its Operations: Set Theoretic Operators (Union, Intersection, Cartesian product, Division), Relational Algebra operators (Projection, Selection, Join, Rename

Relational Calculus: TRC, DRC

Database Language: SQL (DDL, DML, DCL), QBE

U3.2

Self study: Case study Using PL/SQL, DB functions (Date, Timestamp), Cursors

Unit 4: Title – Normalization (7 Hrs)

U4.1

Normalization: Anomalies of un-Normalized Relation, Need of Normalization, Pros and Cons of Normalization, Functional Dependency: Trivial, Full, Partial, Transitive, Multivalued, Join, Inclusion Dependency, Dependency Diagram, Inference Rules for Functional Dependencies, Closure of Functional Dependencies, Algorithms to find: 1. Candidate Key, 2. Closure of Attribute Set, 3. Minimal Cover of Functional Dependencies, Normal Forms: Checking of Lossless Join Decomposition and Dependency Preservation, Normal Forms: 1NF, 2NF, 3NF, BCNF, 4NF.

U4.2

Self study: Normal Forms: 5NF and DKNF, Normalization at Conceptual Level.

Unit 5: Title- Transaction Management (7 Hrs)

U5.1

Complexity Theory: Transaction: Concept, ACID properties, Transaction States; Schedule: Definition, Types of Schedule, Serializability, Conflict and View Serializability, Precedence Graph, Recoverable Schedule, Cascade less Schedule, Deadlock, Concurrency Control Protocols: Lock Based, Timestamp Based Protocol, Recovery System: Log based Recovery, Checkpoint, Shadow paging.

U5.2

Self study: Tree and Multi version Protocol for Concurrency Control, ARIES Recovery Technique, Deadlock Handling.

Note: Five assignments to be given to the students on self study, comprising of one assignment from each unit.

Text Books

T1. "Database System Concepts", Silberschatz, Korth, Sudarshan, McGraw Hill

International Edition, ISBN- 0-07-228363-7, 4th Edition.

T2. "Fundamentals of Database Systems", Elmasri and Navathe, Pearson Education,

ISBN 81-297-0228-2, 4th Edition.

Reference Books

R1. "Database Systems", Thomas Connolly and Carolyn Begg, Pearson Education,

ISBN 81-7808-861-4, 3rd Edition.

R2. "Database Management Systems", Ramakrishnan and Gehrke, McGraw-Hill

International Edition, ISBN 0-07-115110-9, 3rd Edition.

R3. An introduction to Database System – Bipin Desai, Galgotia Publications

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Differentiate the database concepts from conventional file storage system and describe DBMS architecture, relational, hierarchical and network database models
2. Be able to analyze application data using E-R modeling and describe the logical and physical database designs.
3. Learn relational algebra, calculus and apply structured query language (SQL) for database definition and manipulation.
4. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
5. Use transaction management systems and recover methods

Database Engineering Tutorial

Course Code: IT20132 **REF NO: To be filled by CD office**

Credits: 01 **Teaching Scheme: -** Tutorial 01 Hrs/Week

Prerequisites:
1. Computer Programming
2. Knowledge of Data Structures

Objectives:

To introduce database systems and learn the techniques of data modeling, database design, data retrieval and database management.

Course Details:

List of Contents

Tutorial No. 1: Basics of Database Management System

Tutorial No. 2: Relational algebra operations and sample problems.

Tutorial No. 3: Understanding relational calculus and sample problems.

Tutorial No. 4: Understanding ER model with extended ER features, and mapping of ER model to relation.

Tutorial No. 5: Understanding storage structure and access strategy.

Tutorial No. 6: Overview of functional and multi-valued dependency and concepts of normalization.

Tutorial No. 7: Understanding different types of normal forms.

Tutorial No. 8: Concepts of SQL and PL/SQL.

Tutorial No. 9: Understanding concepts of transaction processing systems

Tutorial No. 10: Overview of concurrency control and recovery concepts. ,

Text Books

T1. "Database System Concepts", Silberschatz, Korth, Sudarshan, McGraw Hill International Edition, ISBN- 0-07-228363-7, 4th Edition.

T2. "Fundamentals of Database Systems", Elmasri and Navathe, Pearson Education, ISBN 81-297-0228-2, 4th Edition.

Reference Books

R1. "Database Systems", Thomas Connolly and Carolyn Begg, Pearson Education, ISBN 81-7808-861-4, 3rd Edition.

R2. "Database Management Systems", Ramakrishnan and Gehrke, McGraw-Hill International Edition, ISBN 0-07-115110-9, 3rd Edition.

R3. An introduction to Database System – Bipin Desai, Galgotia Publications

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Differentiate the database concepts from conventional file storage system and describe DBMS architecture, relational, hierarchical and network database models
2. Be able to analyze application data using E-R modeling and describe the logical and physical database designs.
3. Learn relational algebra, calculus and apply structured query language (SQL) for database definition and manipulation.
4. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
5. Use transaction management systems and recover methods

COURSE CODE: IT20332 **REF NO: To be filled by CD office**

Database Engineering Lab

Credits: 2 **Teaching Scheme:** Laboratory 2 Hrs/Week

Prerequisites:
1. Computer Programming
2. Knowledge of Data Structures

Objectives: To implement queries by using Structured Query Language.

Course Details:

List of Practicals:

Experiment No. 1: Use of DDL commands.
Experiment No. 2: Use DML commands.

Experiment No. 3: Use of DQL commands.

Experiment No. 4: Programs using Relational Operators such as JOIN, PROJECT etc

Experiment No. 5. .Programs using PL/SQL.

Experiment No. 6: Programs on Database Triggers.

Experiment No. 7: Programs on Packages.

Experiment No. 8:. Development of an example program using Check Point Technique

Experiment No. 9: Development of an example Concurrent Program and Serialization using Locking Protocol.

Experiment No. 10: Development of a JAVA program with JDBC.

Text Books:

T1. "Oracle 8i-PL/SQL programming", SCOTT Urman, TMH-2000

T2. "ORACLE 10g Lab Guide", Rob, Coronel & Crockett, International Edition

T3."The Programming Language Of Oracle", IVAN BAYROSS, BPB Publication, Edition, Year of Publication.

Reference Books

R1. "Oracle 9i-the Complete Reference", Loney, TMH-2000

Note: At least one Text Book and one Reference Book must be from Foreign Author/Foreign Publisher.

Upon completion of the course, graduates will be able to –

1. Apply the concept for database design, create database, and develop queries
2. Implement different database programs using procedures, function, and cursor.
3. Implement database features such as triggers, packages etc.
3. Implement ODBC/JDBC connectivity with programming languages and write programs to store and retrieve data by using queries.
4. Use transaction management systems and recovery methods.

COURSE CODE: CS20134 **REF NO: To be filled by CD office**

Design & Analysis of Algorithms

Credits: 3 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:

1. Computer programming
2. Data Structures

Objectives:

1. To solve basic problem using different design strategies of algorithm.
2. To analyze time complexity using asymptotic notation.

Course Details:

Unit 1: Title Overview of Time Complexity analysis, Divide and Conquer (6 Hrs)

U1.1

Introduction to design and analysis of algorithms, Growth of Functions, Asymptotic notations (Big Oh, small oh, Big Omega, Theta notations). Recurrences, Solution of recurrences by substitution, Iteration, recursion tree and Master methods. Priority Queue, Analyzing Quick sort, Merge sort, Heap sort, Lower bounds for sorting.

U1.2

Self Study: Counting sort, Selection Sort and Insertion Sort, Binary search, Hashing.

Unit 2: Title - Dynamic Programming and Greedy Strategies (6 Hrs)

U2.1

General strategy of Dynamic programming, Matrix Chain multiplication, and Longest common subsequence, Activity-selection problem, Knapsack problem, Huffman codes.

U2.2

Self Study: Assembly Line Scheduling and 0/1 Knapsack problem

Unit 3: Title- Disjoint sets and Graph Algorithm (6 Hrs)

U3.1

Disjoint sets: Disjoint set operations, Linked list representation, Disjoint set forests, Minimum Spanning Trees, Kruskal and Prim's algorithms, Single- Source shortest paths (Bellman-ford and Dijkstra's algorithms), All-pairs shortest paths (Floyd – Warshall Algorithm).

U3.2

Self Study: Breadth first and depth-first search

Unit 4: Title- Branch and Bound, Back tracking, String Matching (6 Hrs)

U4.1

Branch and Bound: General Strategy of Branch and Bound and back tracking, 0/1 Knapsack, Travelling Salesperson Problem, n-Queen's problem, General strategy for string matching, Robin-Karp Algorithm.

U4.2

Self Study: Subset sum problem, **N**aïve-string matching

Unit 5: Title- Complexity Theory, Approximation algorithms (6 Hrs)

U5.1

Complexity Theory: Overview of deterministic and non deterministic Algorithms. Time Complexity classes P, NP, Co-NP, Notion of NP-hardness and NP-completeness. NP-Complete problems (without proof), Traveling Salesman Problem.

U5.2

Self Study: Vertex-Cover Problem,

Note: Five assignments to be given to the students on self study, comprising of one assignment from each unit.

Text Books

T1. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm", PHI

2nd edition, 2001. ISBN 81-203-2141-3

T2. Horowitz, Sahani, "Fundamentals of computer Algorithms", Galgotia. 2nd Edition,

1998.ISBN 81-7515-257-5

Reference Books

R1. Bressard, Bratley "Fundamentals of Algorithmics." ,PHI, 2nd Edition,1996, ISBN

81-203-1131-0.

R2. Algorithms by Sanjay Dasgupta, Umesh Vazirani – McGraw-Hill Education.

R3. Algorithm Design – Goodrich, Tamassia, Wiley India.

R4. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson, 1st edition, 2005. ISBN

978-81-317-0310-6

Note: At least one Text Book and one Reference Book must be from Foreign Author/Foreign Publisher.

Course Outcomes:

Upon completion of the course, graduates will be able –

1. To analyze asymptotic notation and worst, average and best case analysis using suitable mathematical tools.

2. To design efficient algorithms for computational problems using appropriate algorithmic paradigm.

3. To understand different graph algorithms and string matching problems.

4. To analyze the complexity of different class of problems.

5. To explain the role of randomization and approximation in computation

Design & Analysis of Algorithms TUTORIAL

COURSE CODE: CS20134 **REF NO: To be filled by CD office**

Credits: 01 **Teaching Scheme: -** Tutorial 01 Hrs/Week

Prerequisites:
1. Computer programming
2. Data Structures

Objectives:

1. To analyze time complexity using asymptotic notation.
2. To solve problems using different algorithm design strategies.
3. Concepts of class P, NP, NP-C, NP-Hard, Co-NP.

Course Details:

List of Contents

Tutorial No.1: Basics of Asymptotic notations such as Big Oh, small oh, Big Omega, Theta notations.

Tutorial No.2: Solving Recurrence relation by substitution, Iteration, recursion tree and Master methods.

Tutorial No.3: Analyzing the time complexity of different sorting and searching algorithms.

Tutorial No.4: General strategy of Dynamic programming and Greedy strategies.

Tutorial No.5: Solving MCM, LCS, Knapsack and Hoffman's code problems.

Tutorial No.6: Overview of Graph searching algorithm such as BFS and DFS.

Tutorial No.7. Principles of Minimum spanning tree and solving problem on single source shortest path.

Tutorial No.8: General Strategy of Branch and Bound and back tracking

Tutorial No.9: Overview of classes P, NP, Co-NP, Notion of NP-hardness and NP-C.

Tutorial No.10: Overview of string matching algorithm and solving problems.

Text Books

T1. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm", PHI

2nd edition, 2001. ISBN 81-203-2141-3

T2. Horowitz, Sahani, "Fundamentals of computer Algorithms", Galgotia. 2nd Edition,

1998.ISBN 81-7515-257-5

Reference Books

R1. Bressard, Bratley "Fundamentals of Algorithmics." ,PHI, 2nd Edition,1996, ISBN 81-203-1131-0.

R2. Algorithms by Sanjay Dasgupta, Umesh Vazirani – McGraw-Hill Education.

R3. Algorithm Design – Goodrich, Tamassia, Wiley India.

R4. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson, 1st edition, 2005. ISBN 978-81-317-0310-6

Note: At least one Text Book and one Reference Book must be from Foreign Author/Foreign Publisher.

Course Outcomes:

Upon completion of the course, graduates will be able –

1. To analyze asymptotic notation and worst, average and best case analysis using suitable mathematical tools.
2. To design efficient algorithms for computational problems using appropriate algorithmic paradigm.
3. To understand different graph algorithms and string matching problems.
4. To analyze the complexity of different class of problems.
5. To explain the role of randomization and approximation in computation

COURSE CODE: CS20334 **REF NO: To be filled by CD office**

Design and Analysis of Algorithms Lab

Credits: 02 **Teaching Scheme:** Laboratory 02 Hrs/Week

Prerequisites:
1. Computer programming
2. Data Structures

Objectives:

1. To implement Different algorithms by using a Programming language.

Course Details:

List of Sample Programs:

Experiment No. 1:
Problem solution using a stack of characters, convert an infix string to postfix string.

Experiment No. 2:
Problem solution using insertion, deletion, searching of a BST.

Experiment No. 3:
(a) Problem solution using binary search and linear search in a program
(b) Problem solution using a heap sort.

Experiment No. 4:
(a) Problem solution using DFS/ BFS for a connected graph.
(b) Problem solution using Dijkstra's shortest path algorithm using BFS.

Experiment No. 5:
(a) Write a program to implement Huffman's algorithm.
(b) Problem solution using MST (Kruskal / Prim) algorithm.

Experiment No. 6:
(a) Write a program requiring an application of Quick sort algorithm.
(b) Write a program requiring an application of merge sort algorithm.
(c) Compare the performance of Quick sort and Merge Sort algorithms.

Experiment No. 7:
Problem solution using Strassen's matrix multiplication algorithm.

Experiment No. 8:
Write down a program to find out a solution for 0 / 1 Knapsack problem.

Experiment No. 9:
Problem solution using dynamic programming (Longest Common Subsequence).

Experiment No. 10:

Write a program to find out the solution to the N-Queen problem using Dynamic programming and back tracking.

Text Books

T1. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm", PHI

2nd edition, 2001. ISBN 81-203-2141-3

T2. Horowitz, Sahani, "Fundamentals of computer Algorithms", Galgotia. 2nd Edition,

1998.ISBN 81-7515-257-5

Reference Books

R1. Bressard, Bratley "Fundamentals of Algorithmics." ,PHI, 2nd Edition,1996, ISBN 81-203-1131-0.

R2. Algorithms by Sanjay Dasgupta, Umesh Vazirani – McGraw-Hill Education.

R3. Algorithm Design – Goodrich, Tamassia, Wiley India.

R4. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson, 1st edition, 2005. ISBN 978-81-317-0310-6

Note: At least one Text Book and one Reference Book must be from Foreign Author/Foreign Publisher.

Course Outcomes:

Upon completion of the course, graduates will be able –

1. To analyze asymptotic notation and worst, average and best case analysis using suitable mathematical tools.
2. To design efficient algorithms for computational problems using appropriate algorithmic paradigm.
3. To understand different graph algorithms and string matching problems.
4. To analyze the complexity of different class of problems.
5. To explain the role of randomization and approximation in computation

FOURTH SEMESTER IT 2018-19 (PATTERN C-17)

CLOUD COMPUTING

Credits: 3 **Teaching Scheme:** Theory 3 Hrs/Week

Prerequisites:

1. Computer Programming
2. Data Communications & Computer Networks

Objectives:

1. To understand the concepts of Networking and Cloud Computing.
2. To define an IT Infrastructure and describe its components.
3. To identify the need for Data Center Virtualization.
4. To define Data Center Networking and discuss the challenges encountered without Network Virtualization.
5. To describe the features and components of virtualization software (VMware vSphere).

Unit-1: Overview of Computing Paradigm: [4 Hrs]

U1.1: Recent trends in Computing: Grid computing, Cluster computing, Distributed computing, Utility computing, and Cloud computing.

U1.2 Self Study: Data Communications reference models (OSI, TCP/IP), Digital Transmission (Transmission Modes, Line Coding, Sampling),

Unit-2: Introduction to Cloud Computing [6 Hrs]

U2.1 Introduction to Cloud Computing: Cloud Computing (NIST Model), History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages.

Cloud Computing Architecture: Cloud Computing Stack: Working of Cloud Computing, Role of Networks in Cloud computing, Protocols used, Role of Web services.

Service Models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS).

Deployment Models: Public, Private, Community and Hybrid Clouds.

U2.2 Self Study: Evolution of cloud computing, Service management in Cloud Computing.

Unit-3: Data Center Servers and Virtualization [8 Hrs]

U3.1 Data Center Design: DC Topology, Scale and Management.
Data Center Server: Server Building Blocks, Server Availability, Server Security.
Data Center Virtualization: Data Center Virtualization Overview, Virtualization Availability, Virtualization Server Hierarchy, Functions and Benefits, Virtualization Performance.

U3.2 Self Study: Data Center Storage Hierarchy

Unit-4: Data Center Networking [8 Hrs]

U4.1 Data Center Network Requirements, Architecture, Design Factors for Data Center Networks, Virtual Ethernet, Data Center Routing, Addressing, Transport layer protocols.
Network Virtualization: Virtualization Technologies for the Data Center Network: Switching techniques, Traffic patterns, Network Node virtualization, Virtual Network Services.

Server virtualization software: VMware VSphere, Features and Components of VMware VSphere, VSphere e Solutions to Data Center Challenges.

U4.2 Self Study: Virtual Network Security

Unit-5: Virtual Machine Management [8 Hrs]

U5.1 Virtual Machine Management: Configuration, Placement and Resource Allocation. Creating and Configuring Hyper-V Network Virtualization, Overview of Backup and Restore Options for Virtual Machines, Protecting Virtualization Infrastructure by Using Data Protection Manager.

Power efficiency in Virtual Data centers, Fault Tolerance in Virtual Data Centers, Resource Scheduling, Performance.

U5.2 Self Study: ACE Virtual Contexts and Case Studies

Text Books:

T1. Windows Server 2012 Hyper-v Installation and Configuration Guide, Aidan Finn, , Patrick Lownds , Michel Luescher , Damian Flynn , John Wiley and Sons.
T2. IT Infrastructure and Its Management: Phalguni Gupta and Surya Prakash,Tata McGraw-Hill, 2009.
T3. Cloud Computing: Concepts, Technology & Architecture, Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Prentice Hall, 2013

Reference Books:

R1. IBM Data Center Networking: Planning for Virtualization and Cloud Computing, 1st Edition (May 2011).
R2. Data Center Networks: Topologies, Architectures and Fault-Tolerance Characteristics, By Yang Liu, Jogesh K Muppala, Malathi Veeraraghavan, Dong Lin, Mounir Hamdi, Springer.
R3. Mastering in Cloud Computing: R.Buyya, Christian Vecchiola, and Thamarai Selvi , Tata

McGraw Hill Education Private Limited, India, ISBN-13: 978-1-25-902995-0

R4. Data Communications and Networking: Behrouz A. Forouzan, Tata McGraw-Hill, 4th Edition.

Outcomes

Students will be able to:

1. Understand and differentiate different modes in the computing paradigm.
2. Understand the role of networking in the cloud architecture, and differentiate cloud service models.
3. Analyze and model data center virtualization.
4. Analysis data center networking requirement and use different virtualization technologies and related software.
5. Manage virtual machines and data center.

COURSE CODE: EC21106 **REF NO: To be filled by CD office**

Switching Circuits and Logic Design

Credits: 02 **Teaching Scheme: -** Theory 03 Hrs/Week

Prerequisites: Semiconductor Devices and Circuits

Corequisites: Nil

Post requisites: Microprocessors and Microcontrollers, VLSI Design

Objectives:

With the significant evolution and increased complexity of digital systems in recent years, the main objective of this course is to obtain a basic understanding of Logic Design and set the stage to perform the analysis and design of complex switching circuits. The course portrays excellent ideas of logic gates, Simplification using Boolean Algebra and K-Maps, to make the students understand the concept of Combinational Circuits, Sequential Circuits and Finite State Machines better.

Course Outcomes:

CO1: Identify Number systems, logic gates & different coding techniques and apply the fundamental concepts of Boolean Algebra and K-Maps to simplify Boolean Functions.

CO2: Demonstrate the operation of various combinational and sequential circuits

CO3: Describe different state machines and understand the design of various systems using state machines.

CO4: Read voluntarily to enhance the knowledge in switching circuits and logic design.

Course Details:

Unit 1

Introduction to Digital Systems **(07 Hrs)**

U1.1. Introduction to Logic Design, Transistors as switches, Number Systems and their inter-conversion, Binary Arithmetic, Complements, Complement arithmetic, Standard logic gates, Derived gates, Gray code, Error Detecting and Correcting Codes. [T1: Chapter 1.3, 2.1 – 2.3, 2.6, 2.7, 2.9, 3.3]

U1.2. CMOS Gates, Binary Coded Decimal codes, Weighted Codes. [T1: Chapter 1.18, 2.9]

Unit 2

Boolean Algebra & Minimization (07 Hrs)

U2.1. Boolean operations, Boolean functions, Simplification of logic function using Boolean algebra, De Morgan's Theorem, Minterms and Maxterms, Sum-of-Products and Product of-Sums representations, Karnaugh map up to 4 variables, Prime Implicants and Essential Prime Implicants, Universal logic gates, NAND implementation. [T1: Chapter 3.1 – 3.9; T2: Chapter 3.6]

U2.2. Don't care conditions, 5 variable K-Map, Quine-McCluskey technique, NOR implementation. [T1: Chapter 3.10 – 3.12, ; T2: Chapter 3.6]

Unit 3

Combinational Logic Circuits (07 Hrs)

U3.1. Adders (Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel Adders, CLA, 4-Bit Adder/Subtractor Circuit), Binary Multiplier, 2-Bit and 3-Bit Magnitude Comparators, Decoders and Encoders, Priority Encoder, Multiplexers and Demultiplexers, Binary to Gray Code Converters.[T1: Chapter 4.1 – 4.4, 4.8, 4.12 – 4.14; T2: Chapter 4.6]

U3.2. 4-Bit Magnitude Comparator, Parity Generator and Checker, Gray to Binary Code Converters. [T1: Chapter 4.8, 4.9 – 4.11, 4.14]

Unit 4

Sequential Logic Circuits (08 Hrs)

U4.1. Concept of Latches and Flipflops (SR, JK, D and T), Conversion of Flipflops, Master-Slave Flipflops, Registers and Shift Registers, Binary and BCD ripple counters, Synchronous Counters, Analysis and Design of Sequential Logic Circuits. [T1: Chapter 5.1 – 5.11, 5.14 – 5.18, 5.20, 5.21]

U4.2. Finite State Machines, Ring Counters, Twisted Ring counters, Serial Binary Adder. [T1: Chapter 5.12, 5.19]

Unit 5

Algorithmic State Machines (07 Hrs)

U5.1. Introduction, Algorithmic State Machines, Realization of ASM Charts, Examples on ASM Charts, Register Transfer Language, RTL Notations. [T1: Chapter 7.1 – 7.6]

U5.2. Data Unit Construction from an RTL Description, Examples of Weighing Machine, Binary Multiplier. [T1: Chapter 7.7]

Note: Five assignments to be given to the students on self study, comprising of one assignment from each unit.

Text Books:

T1. "Digital Electronics", G. K. Kharate, Oxford University Press, 2012
T2. "Digital Design: with an introduction to the Verilog HDL", Mano, M. Morris and Michael D Ciletti, Pearson India, 5th Edition, 2013.

Reference Books

R1. "Digital Fundamentals", Thomas L. Floyd, Pearson India, 10th Edition, 2011.
R2. "Digital Systems – Principles and Applications", Ronald J. Tocci, Neal S. Widmer and Gregory L. Moss, Pearson Education, 10th Edition, 2009.
R3. "Modern Digital Electronics", R. P. Jain, Tata Mcgraw Hill Publication, 4th Edition, 2003.
R4. "Digital Electronics, Principles and Integrated Circuit", Anil K. Maini, Wiley India Pvt. Ltd., 1st Edition, 2007.

Note: At least one Text Book and one Reference Book must be from Foreign Author/Foreign Publisher.

COURSE CODE: EC21306 **REF NO: To be filled by CD office**

Switching Circuits and Logic Design Lab

Credits: 01 **Teaching Scheme: -** Laboratory 02 Hrs/Week

Prerequisites: Semiconductor Devices and Circuits Laboratory

Corequisites: Nil

Postrequisites: Microprocessors and Microcontrollers Laboratory, VLSI Design Laboratory

Objectives:

The objective of this course is to let the students assemble and test the functionalities of various combinational and sequential circuits and understand the fundamentals of operation of a memory unit, which are the basic building blocks of an electronics gadget. This course also introduces the concept of VHDL programming to students which is required now-a-days to design any logic circuit.

Course Outcomes:

CO1: Identify the operation of different logic gate ICs, demonstrate the minimization of Boolean Functions and observe the operation of various combinational circuits.

CO2: Describe the concept of flipflops, demonstrate the operation of sequential circuits and observe the fundamental operation of a memory unit.

CO3: Practice different VHDL and C programs of digital logic circuits.

CO4: Practice the experimental skills to solve digital electronics problem.

Course Details:

List of Practicals: (*Any* 10**)**

Experiment No. 1: Study of logic behavior of AND, OR, NAND, NOR, EX-OR, EX NOR, Invert and Buffer gates, use of Universal NAND Gate.

Experiment No. 2: Gate-level minimization of Boolean functions and their implementation using universal NAND and NOR gates.

Experiment No. 3: Assemble and test of Combinational Circuits (Half Adder, Full Adder, Half Subtractor, Full Subtractor, 2-bit Adder/Subtractor).

Experiment No. 4: Assemble and test of Combinational Circuits (binary to gray code converters, gray to binary code converter and 7 segment display).

Experiment No. 5: Design and implement a 2:4 decoder and 4:2 encoder circuit.

Implementation of Boolean Functions using decoders.

Experiment No. 6: Design of 4:1 multiplexers and 1:4 de-multiplexers and Implementation of Boolean Functions using multiplexers.

Experiment No. 7: Assemble, Test and Investigate operation of SR, D, J-K and T flip-flops.

Experiment No. 8: Design and investigate the operation of all types of shift registers.

Experiment No. 9: Design, assemble and test 4-bit ripple up counter and 4-bit synchronous down counters

Experiment No. 10: Design and implement a circuit that multiplies 4-bit unsigned numbers to produce an 8-bit product

Experiment No. 11: Verilog/VHDL simulation and implementation of Experiments listed at Sl. No. 1 to 10

Experiment No. 12: C/C++ implementation of Experiments listed at Sl. No. 1 to 10

Text Books:

T1. "SCLD Laboratory Manual", Department of ETC, C. V. Raman College of Engineering, Bhubaneswar, 2nd Edition, 2015
T2. "Digital Design: with an introduction to the Verilog HDL", Mano, M. Morris and Michael D Ciletti, Pearson India, 5th Edition, 2013.
T3. "A VHDL Primer", J. Bhasker, PHI Learning, 3rd Edition, 2009

Reference Books

R1. "Digital Fundamentals", Thomas L. Floyd, Pearson India, 10th Edition, 2011.
R2. "Modern Digital Electronics", R. P. Jain, Tata Mcgraw Hill Publication, 4th Edition, 2003.
R3. "Digital Electronics, Principles and Integrated Circuit", Anil K. Maini, Wiley India Pvt. Ltd., 1st Edition, 2007.

Note: At least one Text Book and one Reference Book must be from Foreign Author/Foreign Publisher

COURSE CODE: IT24351 **REF NO:** To be filled by CD office

LINUX OPERATING SYSTEM ADMINISTRATION

Credits: 01 **Teaching Scheme:** Laboratory 02Hrs/Week

Prerequisites:

1. Basic knowledge about architecture and functions of operating system.
2. Basic knowledge of process and file management.
3. Basic knowledge of networking concepts.

Objectives: The objectives of this laboratory course are:

1. To provide students with a fundamental working principle of Linux environment.
2. To know how file system is used in Linux operating system.
3. To have knowledge of file sharing and network configuration in Linux environment.
4. To have knowledge on how to write scripts for system automation.

Course Details:

Laboratory experiments will be conducted on the following topics, after providing theoretical concepts and demonstration as required.

1. Introduction

Introducing Linux, Distributions, file system Hierarchy, devices and drives, booting process, boot loaders, disk partition, controlling and managing services, repository configuration

2. Basics and Components

Kernel, XFree86, Sawfish, Gnome, GNOME Basics, Evolution - the default e-mail client in Fedora Mozilla - Web browser, XScreensaver, How user preferences are stored in your home directory, Updating your system with up2date / yum, How to restart X11: Ctrl-Alt-Backspace

3. Linux shell, Text editors

The command-line (shells, tab completion, cd, ls,file management: cd, df, find, locate,nano, the text editor that replaces pico, man pages - the help system, ssh - secure text-based connectivity to other machines. Demonstrate X-Forwarding, Handling compressed archives with zip and tar, GNU screen - The ability to resume command-line sessions from anywhere

4. Network configuration, Installingsoftwares

User administration of Linux, Network Configuring, Using SSH for network communications, Using VNC for remote management, Network Authentication, Installing new software with yum (if Fedora) or YaST (if SUSE), Installing new software with rpm, Patches & updates

5. User Management

Adding users, groups, su - the obsoleted way to become the root user, sudo - the modern way to run processes as another user, Changing users' passwords with the passwd command, Printing with CUPS.

6. Web based system Adminisration, network Configuration

Installing webmin for easy web based systems administration, Network Configuring, Using SSH for network communications, Using VNC for remote management, Network Authentication, Patches & updates

7. System Configuration, NFS, FTP server setup

System Configuration Files, Perform System Management, X configuration server, Setting up an NFS server, Setting up an FTP server, The Samba Server: networking with Windows system,

8. DHCP, DNS, Proxy, Mail server set up

Configuring a DHCP server, Configuring a DNS server Configuring the Apache web server, Configuring the Squid web proxy cache, Using send mail server, Dovecot: an IMAP and POP server, Performance Tuning and system hardening

9. Maintenance, Troubleshooting and Security

SE LINUX/ APParmor, Basic Service Security, Log Management and NTP, BIND and DNS Security, Network Authentication: RPC, NIS and Kerberos, Apache security(SSL), KVM / xe, Bash Scripting

10. Command line Interface, System Automation

Introduction to BASH Command Line Interface (CLI) Error Handling, Debugging & Redirection of scripts, AWK, Control Structure, Loop, Variable & String, Conditional Statement Regular Expressions

Automate Task Using Bash Script, Security patches, Logging & Monitoring using script.

Text books:

T1. "Linux System Administration ", by Tom Adelstein, Bill Lubanovic.
T2. "Essential System Administration " ,by Æleen Frisch
T3. "Linux Adminsitration Handbook", Evi Nemeth, Trent R. hein, Garth Snyder, Pearson Education, 2nd Edition, ISBN- 9788131713235

Reference Books:

R1. "Linux &Unix System Administration", by O' Reilly Media

R2. "The Practice of System and Network Administration", by Thomas Limoncelli, Christina Hogan, Strata Chalup

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Identify the role and responsibilities of a Linux system administrator.
2. Install and configure the Linux operating system.
3. Analyze resource use and security of a computer running Linux.
4. Make effective use of Linux utilities and scripting languages.
5. Design TCP/IP network services on a Linux system.
6. Develop scripts to automate tasks such as maintenance etc.