

## FOURTH SEMESTER IT 2015-16

**COURSE CODE: IT20102**

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

### **DATABASE ENGINEERING**

**Credits: 03**

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

**Prerequisites:**

1. Computer Programming
2. Knowledge of Data Structures

**Objectives:**

To introduce the major techniques of databases, data retrieval, and database design strategies.

**Course Details:**

**Unit 1**

**(7 Hrs)**

**Title Introduction to DBMS and ER Data Model**

**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

**Unit2**

**(7 Hrs)**

**Title - Relational Data Model.**

**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 Database Query Languages: Relational Algebra, Tuple Relational Calculus, DDLC.

## U2.2

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

## Unit3

(7Hours)

### Title- Normalization

#### U3.1

Normalization: Anomalies of un-Normalized Relation, Need of Normalization, Pros and Cons of Normalization, Denormalization; 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.

#### U3.2

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

## Unit4

(8 Hrs)

### Title- Structured Query Language (SQL)

#### U4.1

SQL: Introduction, Types of queries: DDL, DML, Select, TCL, DCL, Advantages and Disadvantages of SQL; DDL: Create, Drop, Alter Various Database Objects (Table, Table Constraints, View etc.); DML: Insert, Delete and Update Queries, TCL; SELECT Queries: Simple and Nested Queries, Set Membership, Aggregate Functions, Group-by, Having Construct, Join Types, Set Operations, Set Comparison, SQL String Functions, PL/SQL: Block, Cursor, Cursor Types, Procedure, Trigger, Row-level, Statement-level Triggers.

#### U4.2

**Self study:** DCL-Security and Authorization, SQL Date-Timestamp and Numerical Functions, PL/SQL Function, Mapping of Relational Algebra to SQL.

## Unit5

(7 Hrs)

### Title- Transaction Management

#### U5.1

**Complexity Theory:** Transaction: Concept, ACID properties, Transaction States; Schedule: Definition, Types, Serializability, Conflict and View Serializability, Precedence Graph, un/Recoverable Schedule, Cascade less Schedule, Deadlock; Concurrency Control Protocols: Lock Based, Timestamp Based Protocol; Recovery System: Log Based

## U5.2

**Self study:** Tree and Multiversion 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**

1. “Database System Concepts”, Silberschatz, Korth, Sudarshan, McGraw Hill International Edition, ISBN- 0-07-228363-7, 4th Edition.
2. “Fundamentals of Database Systems”, Elmasri and Navathe, Pearson Education, ISBN 81-297-0228-2, 4th Edition.

### **Reference Books**

1. “Database Systems”, Thomas Connolly and Carolyn Begg, Pearson Education, ISBN 81-7808-861-4, 3rd Edition.
2. “Database Management Systems”, Ramakrishnan and Gehrke, McGraw-Hill International Edition, ISBN 0-07-115110-9, 3rd Edition.
3. An introduction to Database System – Bipin Desai, Galgotia Publications

### **Course Outcomes:**

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

1. Applies the conceptual concept for Database Design and understand the DBMS concepts.
2. Analyze and design using different techniques like E-R diagram, normalization etc to get a good and reliable database.
3. Implement a back end tool to be connected with another language and to know how to store and retrieve data by using queries.
4. Use transaction management systems and recover methods.

**COURSE CODE: IT20102**

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

## **DATABASE ENGINEERING TUTORIAL**

**Credits: 01**

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

### **Prerequisites:**

1. Knowledge about computer fundamentals.
2. Knowledge of data structures.
3. Knowledge of storage strategy.

### **Objectives:**

1. Basic concepts about data and information.
2. Introduction to database and their applications.
3. Basic concepts of DBMS and RDBMS, their difference.
4. Understanding the essential concepts of relational data models
5. Understanding the concepts of relational algebra and calculus.
6. Understanding the concepts of DDLC.
7. Understanding the technique of normalization
8. Understanding the concepts of SQL and PL/SQL, their commands.

### **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 dependency and prior 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:**

1. “Database System Concepts”, Silberschatz, Korth, Sudarshan, McGraw Hill International Edition, ISBN- 0-07-228363-7, 4th Edition.
2. “Fundamentals of Database Systems”, Elmasri and Navathe, Pearson Education ISBN 81-297-0228-2, 4th Edition.

**Reference Books**

1. “Database Systems”, Thomas Connolly and Carolyn Begg, Pearson Education, ISBN 81-7808-861-4, 3rd Edition.
2. “Database Management Systems”, Ramakrishnan and Gehrke, McGraw-Hill International Edition, ISBN 0-07-115110-9, 3rd Edition.
3. .An introduction to Database System – Bipin Desai, Galgotia Publications

**COURSE CODE: IT20302**

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

## **DATABASE ENGINEERING LAB**

**Credits: 1**

**Teaching Scheme: - Practical 2 Hrs/Week**

**Prerequisites:** Computer Programming

**Objectives:** To implement queries by using Structured Query Language.

**Course Details:**

### **List of Practicals:**

**Experiment No.1:** Use of SQL syntax: insertion, deletion, join, updation using SQL.

**Experiment No.2:** Programs on join statements and SQL queries including where clause.

**Experiment No.3:** Programs on procedures and functions.

**Experiment No. 4:** Cursor, Cursor Types

**Experiment No.5.** .Programs on database triggers.

**Experiment No.6:** Programs on packages.

**Experiment No.7:** Programs on data recovery using check point technique.

**Experiment No.8:** Concurrency control problem using lock operations

**Experiment No.9:** Programs on ODBC

**Experiment No.10:** Programs on JDBC.

### **TextBooks:**

T1. "The Programming Language Of Oracle", IVAN BAYROSS, BPB Publication, Edition,  
Year of Publication.

T2. "oracle 8i-PL/SQL programming", SCOTT Urman, TMH-2000

T3.. "ORACLE 10g Lab Guide", Rob, Coronel & Crockett, International Edition

## **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.

**COURSE CODE: CS20104**

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

## **DESIGN & ANALYSIS OF ALGORITHM**

**Credits:03**

**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, Lower bounds for sorting

##### **U1.2**

**Self Study:** Analyzing Quick sort, Merge sort, Counting sort, Heap sort and Binary search.

#### **Unit2**

**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

#### **Unit3**

**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

## Unit4- 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, Naïve-string matching

## Unit5

### 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:

1. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm", PHI 2nd edition, 2001. ISBN 81-203-2141-3
2. Horowitz, Sahani, "Fundamentals of computer Algorithms", Galgotia. 2nd Edition, 1998. ISBN 81-7515-257-5

### Reference Books:

1. Bressard, Bratley "Fundamentals of Algorithmics." ,PHI, 2nd Edition,1996, ISBN 81-203-1131-0.
2. Algorithms by Sanjay Dasgupta, UmeshVazirani – McGraw-Hill Education.
3. Algorithm Design – Goodrich, Tamassia, Wiley India.
4. 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: CS20104**

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

## **DESIGN & ANALYSIS OF ALGORITHM (TUTORIAL)**

**Credits:01**

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

### **Prerequisites:**

1. Knowledge of programming languages.
2. Knowledge of 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 ofContents**

**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

**TutorialNo. 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**

1. Thomas H Cormen and Charles E.L Leiserson, “Introduction to Algorithm”, PHI 2nd edition, 2001. ISBN 81-203-2141-3
2. Horowitz, Sahani, “Fundamentals of computer Algorithms”, Galgotia. 2nd Edition, 1998.ISBN 81-7515-257-5

### **Reference Books**

1. Bressard, Bratley “Fundamentals of Algorithmics.” ,PHI, 2nd Edition,1996, ISBN 81-203-1131-0.
2. Algorithms by Sanjay Dasgupta, UmeshVazirani – McGraw-Hill Education.
3. Algorithm Design – Goodrich, Tamassia, Wiley India.
4. 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:** CS20304

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

**DESIGN AND ANALYSIS OF ALGORITHMS LAB**

**Credits:**01

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

**Prerequisites:**

Computer Programming

**Objectives:**

To implement Different algorithms by using a Programming language.

**Course Details:**

**List of Sample Programs:**

**Experiment No.1:**

Using a stack of characters, convert an infix string to postfix string.

**Experiment No.2:**

Implement insertion, deletion, searching of a BST.

**Experiment No.3:**

(a) Implement binary search and linear search in a program

(b) Implement a heap sort using a max heap

**Experiment No.4:**

(a) Implement DFS/ BFS for a connected graph.

(b) Implement Dijkstra's shortest path algorithm using BFS.

**Experiment No.5:**

(a) Write a program to implement Huffman's algorithm.

(b) Implement MST using Kruskal / Prim algorithm.

**Experiment No.6:**

- (a) Write a program on Quick sort algorithm.
- (b) Write a program on merge sort algorithm.

**Experiment No.7:**

Implement 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:**

Using dynamic programming implement LCS.

**Experiment No.10:**

- (a) Find out the solution to the N-Queen problem.
- (b) Implement back tracking using game trees.

**Text Books**

1. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm", PHI 2nd edition, 2001. ISBN 81-203-2141-3
2. Horowitz, Sahani, "Fundamentals of computer Algorithms", Galgotia. 2nd Edition, 1998. ISBN 81-7515-257-5

**Reference Books**

1. Bressard, Bratley "Fundamentals of Algorithmics", PHI, 2nd Edition, 1996, ISBN 81-203-1131-0.
2. "Algorithms by Sanjay Dasgupta, Umesh Vazirani" – McGraw-Hill Education.
3. Goodrich, Tamassia "Algorithm Design", Wiley India.
4. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson, 1st edition, 2005. ISBN 978-81-317-0310-6.

**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: IT20103**

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

## **CLOUD COMPUTING**

**Credits: 3**  
Hrs/Week

**Teaching Scheme: Theory 3**

### **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 VMware vSphere.

### **Unit-1: Basics of Networking**

**[04 Hrs]**

**U1.1** Overview of Data Communications, Fundamentals of Network, Network Topologies, Services, Standardization, Reference Models: OSI Model, TCP/IP Model.

Physical Layer: Analog and Digital Signals, Data Rate Limits, Transmission Impairment.

Digital Transmission: Transmission Modes, Line coding, Sampling.

**U1.2 Self Study:** Transmission Media (Guided and Unguided)

### **Unit-2: Introduction to Cloud Computing**

**[8 Hrs]**

**U2.1** Overview of Computing Paradigm: Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing.

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 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:**

1. Data Communications and Networking: Behrouz A. Forouzan, Tata McGraw-Hill, 4th Edition.
2. IT Infrastructure and Its Management: Phalguni Gupta and Surya Prakash, Tata McGraw-Hill, 2009.
3. Cloud Computing: Concepts, Technology & Architecture, Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Prentice Hall, 2013

#### **Reference Books:**



1. IBM Data Center Networking: Planning for Virtualization and Cloud Computing, 1st Edition (May 2011).
2. Data Center Networks: Topologies, Architectures and Fault-Tolerance Characteristics, By Yang Liu, Jogesh K Muppala, Malathi Veeraraghavan, Dong Lin, Mounir Hamdi, Springer.

### **Course Outcome**

#### **Students will be able to:**

1. Design and implement a server infrastructure.
2. Analyze and model data center virtualization.
3. Analysis and synthesis of data center networking.
4. Learn the features of VMware, vSphere and resolve issues and challenges.

CODE: MA21107 : Probability and Statistics

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

**Prerequisites:** 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 aware of some of the readily applied probability distributions such as Binomial Distribution, Poisson distribution, Normal distribution, Gamma, 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**

**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<sub>2</sub>]

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

**Unit 2**

**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<sub>2</sub>]

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

**Unit 3**

**Some Sampling Distributions and their 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. [T<sub>2</sub>]

**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. [T<sub>2</sub>]

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

#### **Unit 4**

##### **Testing of Hypotheses and Simple 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. [T<sub>2</sub>]

**Introductory concepts of Correlation and Regression:** Karl Pearson Coefficient of Correlation, Regression and Lines of Regression. [T<sub>1</sub>]

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

#### **Unit 5**

##### **Stochastic Process (08 Hrs)**

**U5.1** Definition of Stochastic Process, The Poisson Process, Birth-and-Death Process, Markov Chains [T<sub>3</sub>]

**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, 11<sup>th</sup> Revised Edition, 2002.

**Chapters:** 10 (10.1 – 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, 2<sup>nd</sup> 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 Processes, T. Veerarajan, Tata McGraw-Hill Publishing Company Limited, New Delhi, Third Edition, 2008.
- R5. Advanced. Engineering Mathematics, Erwin Kreyszig, John Willy and Sons, 8<sup>th</sup> Edition, 1999.
- R6. Introduction to Probability and Statistics, William Mendenhall, Robert J. Beaver & Barbara M. Beaver, CENGAGE Learning India Pvt. Ltd., New Delhi, 13<sup>th</sup> 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, 1<sup>st</sup> Edition, 2011.
- R9. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 43<sup>rd</sup> 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::EC21104**

REF NO: To be filled by CD office

## **DIGITAL ELECTRONIC CIRCUITS**

**Credits:02**

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

**Prerequisites: Nil**

**Course Details:**

### **Unit1**

**Number System, Logic Gates & Coding (08Hrs)**

**U1.1.** Introduction to Number Systems, Data Representation, Binary, Octal, Hexadecimal and Decimal Number System and their inter-conversion, Binary Arithmetic, Complements, Complement arithmetic, Standard logic gates, Derived gates, Binary Coded Decimal codes, Gray code, Error Detecting and Correcting Codes.

**U1.2.** Weighted Codes, Excess-3 Code, EBCDIC Code, ASCII.

### **Unit2**

**Boolean Algebra (07Hrs)**

**U2.1.** Boolean Algebra, Simplification of logic function using Boolean algebra, De Morgan's Theorem, Sum-of-Products and Product of-Sums forms of Boolean function, Canonical and Standard forms, Universal logic gates, NAND implementation, Karnaugh map up to 4 variables, Don't care conditions, Prime Implicants and Essential Prime Implicants.

**U2.2.** XOR Equivalence, NOR implementation, 5 variable K-Map.

### **Unit3**

**Combinational Logic Circuits (09Hrs)**

**U3.1.** Adders (Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel Adders, CLA, 4-Bit Adder/Subtractor Circuit), Binary Multiplier, Multiplexers and Demultiplexers, Decoders and Encoders, Priority Encoder, Binary to Gray Code Converters, 2-Bit and 3-Bit Magnitude Comparators.

**U3.2.** Decimal Adder, Gray to Binary Code Converters, 4-Bit Magnitude Comparator, Parity Generator and Checker.

### **Unit4**

**Sequential Logic Circuits (09Hrs)**

**U4.1.** Concept of Latches, Flipflops, Conversion of Flipflops, Master-Slave Flipflops, Analysis and Synthesis of Sequential Logic Circuits, Shift Registers, Asynchronous & Synchronous Counters.

**U4.2.** State Reduction and State Assignment, Non-binary counters.

## Unit5

### Digital System Design

(07Hrs)

- U5.1.** Semiconductor Memories: RAMs and ROMs, Logic Array, PROM, Different logic families: TTL, ECL, CMOS. Introduction to VHDL, Writing simple VHDL Programs for logic gates.
- U5.2.** PAL and PLA, RTL and DTL Logic Families, Writing simple VHDL Programs for simple combinational circuits (dataflow modeling).

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

#### TextBooks:

- T1. “Digital Design: with an introduction to the Verilog HDL”, Mano, M. Morris and Michael D Ciletti, Pearson India, 5<sup>th</sup> Edition, 2013.
- T2. “Digital Systems – Principles and Applications”, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education, 10th Edition, 2009.
- T3. “A VHDL Primer”, J. Bhasker, PHI Learning, 3<sup>rd</sup> Edition, 2009

#### ReferenceBooks

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

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

#### Course Outcomes:

- CO1: Understand the basic knowledge of Number systems, logic gates and coding techniques.
- CO2: Apply the fundamental concepts of Boolean Algebra and K-Maps to simplify the design of digital logic circuits.
- CO3: Understand the design and use of logic gates to design various combinational circuits.
- CO4: Understand the knowledge of flipflops to design various sequential circuits and Finite State Machines.
- CO5: Apply basic knowledge of logic families for the design of computer memory and write programs using VHDL to simulate and test various digital circuits.

**COURSE CODE:: EC21304**

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

**DIGITAL ELECTRONIC CIRCUITS LAB**

**Credits:01**

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

**Prerequisites: Nil**

**Course Details:**

**List of Practicals: (Any10)**

**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:** design, assemble and test of Combinational Circuits (Half Adder, Full Adder, Half Subtractor, Full Subtractor, 2-bit adder Subtractor).

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

**Experiment No.5:** Binary Multiplier: design and implement a circuit that multiplies 4-bit unsigned numbers to produce an 8-bit product.

**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:** Memory Unit: Investigate the behavior of RAM unit and its storage capacity – 16 X 4 RAM: testing, simulating and memory expansion

**Experiment No.11:** VHDL simulation and implementation of various combinational circuits

## **Experiment No.12: VHDL simulation and implementation of various sequential circuits**

### **TextBooks:**

T1. Lab manuals.

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

### **Course Outcomes:**

- CO1: Understand the basic knowledge of Number systems, logic gates and coding techniques.
- CO2: Apply the fundamental concepts of Boolean Algebra and K-Maps to simplify the design of digital logic circuits.
- CO3: Understand the design and use of logic gates to design various combinational circuits.
- CO4: Understand the knowledge of flipflops to design various sequential circuits and Finite State Machines.
- CO5: Apply basic knowledge of logic families for the design of computer memory and write programs using VHDL to simulate and test various digital circuits.



**COURSE CODE: IT24353**

**REF NO: \_\_\_\_\_**

## **Web Technology Lab**

**Credits: 1**

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

### **Prerequisites:**

1. Computer Programming

### **Objectives:**

1. To introduce the basic techniques involved in designing web pages.
2. To introduce client side scripting with Javascript.
3. To know the advantages and use of CSS.
4. To use CGI/Perl.
5. To use XML.

### **List of Practicals:**

- Experiment No. 1.** Download, Install and Configure apache http server for windows and linux. Design HTML web pages demonstrating the use of various text formatting tags and media file embedding tags
- Experiment No. 2.** Demonstrate the use of HTML5 elements like video, audio, canvas etc.
- Experiment No. 3.** Design HTML pages using tables and frames.
- Experiment No. 4.** Get acquainted with the use of Javascript objects like Window, Screen, Location, Document, History, Frame, Navigator etc.
- Experiment No. 5.** Demonstrate the use of event handling in javascript.
- Experiment No. 6.** Design HTML form embedding javascript code for client side validation.
- Experiment No. 7.** Get acquainted with JQuery JavaScript library.
- Experiment No. 8.** Use different style properties in inline, embedded and external style sheets.
- Experiment No. 9.** Get acquainted with creation, display and parsing of XML documents.
- Experiment No. 10.** Demonstrate the use of CGI/Perl.

### **Text Books:**

1. Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP, BPB Publication, 4th Edition, Ivan Bayross
2. Web Technologies, Uttam K Roy, Oxford

### **Course Outcomes:**

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

- Understand the new features available in HTML5

- Build interactive webpages using javascript.
- Differentiate between webpage structure and style
- Develop webpages with CGI/Perl
- Use XML documents