LECTURE PLAN

MCA

SEMESTER IV

FOR PRIVATE CIRCULATION

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LECTURE PLAN

DESIGN AND ANALYSIS OF ALGORITHMS

MCA-202

COURSE OUTLINE
MCA-IV SEMESTER
DESIGN AND ANALYSIS OF ALGORITHMS- MCA 202

L - 4 Credits – 04

OBJECTIVE:

The purpose of this course is to enable the students to learn the basic concepts of designing algorithms and analyzing them in terms of space and time complexity. It provides the explanation of the mathematics needed to understand the analysis of algorithms and enhance the knowledge on various techniques of searching and sorting. It also explains the various string matching algorithms that are used in various applications. It helps the students to understand the solvable and insolvable class of algorithms. The same can be applied to solve the real life problems.

INTERNAL ASSESSMENT AND ASSIGNMENT **(40 Marks)**
1. Class Test-I – (Written Test) (**15 Marks)**
2. Class Test-II - (Written Test) (**15 Marks)**
3. Class Assessment + Attendance (**10 Marks)**

COURSE CONTENTS:

UNIT-1 **(10 Hours)**

- Notion of Algorithm
- Growth of functions
- Recurrences
    - The substitution method
    - The iteration method
    - The master method
- Asymptotic Notations and Basic Efficiency Classes
- Mathematical Analysis of few Non-recursive and Recursive Algorithms
- Proof of Correctness

UNIT-II **(10 Hours)**

- Sorting Techniques
    - Insertion Sort
    - Selection Sort
    - Bubble Sort
- Searching Techniques
    - Linear Search
    - Binary Search
- Depth First Search
- Breadth First Search
- AVL Trees
- Red-Black trees

- Heaps and Heap sort
- Hash Tables
- Disjoint set data structures
- Divide and Conquer Paradigm
    - Merge Sort
    - Quick Sort
- Binary search trees
- Sorting in linear time
    - Counting Sort
    - Bucket Sort
    - Radix Sort
- Medians and order statistics

UNIT-III **(10 Hours)**

- Greedy Techniques
    - An activity selection problem
    - Huffman Codes
    - A task scheduling problem.
- Strongly Connected Components
- Algorithm for finding Minimum cost Spanning Trees
    - Prim's Algorithm
    - Kruskal's Algorithm
- Dynamic Programming paradigm
    - Optimal Binary Search trees
    - Matrix multiplication Problem
- Algorithm for finding Single source shortest paths
    - Dijkstra's Algorithm
    - Bellman Ford Algorithm
- Floyd – Warshall algorithm for all pair shortest paths
- String Matching
    - The Naïve String Matching algorithm
    - The Rabin-Karp Algorithm
    - String Matching with finite automata
    - The Knuth-Morris Pratt algorithm.

UNIT-IV: **(10 Hours)**

- Backtracking
- n-Queen's Problem
- Hamiltonian Circuit problem
- Subset-Sum problem
- Branch and bound
- Assignment problem
- Travelling salesman problem
- Polynomial-time verification
- NP-Completeness and Reducibility

- NP-Completeness Proof
- NP-Complete problems
    - The Clique Problem
    - The Vertex Cover Problem
    - The Hamiltonian cycle Problem
    - Traveling Salesman Problem
- Proof of cook's theorem.

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of Design and Analysis of Algorithms and students are advised to go through the material for thorough understanding of the subject.

- **MAIN TEXT BOOK**

1. **Author's Name(s):** Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein
   Title: Introduction to Algorithms
   Edition: III **Year:** 2013
   Publisher: PHI (ibid 1)

2. **Author's Name(s):** Anany Levitin
   Title: Design and Analysis of Algorithm
   Edition: II **Year:** 2015
   Publisher: Pearson (ibid 4)

- **REFERENCE BOOKS**

1. **Author's Name(s):** NitinUpadhayay
   Title: The Design and Analysis of Algorithms
   Edition: IV **Year:** 2012
   Publisher: S.K. Kataria& Sons (ibid 2)

2. **Author's Name(s):** UditAgarwal
   Title: Algorithms Design and Analysis
   Edition: VI **Year:** 2014
   Publisher: Dhanpat Rai & Co. (ibid 3)

3. **Author's Name(s):** A. A. Puntambekar
   Title: Design and Analysis of Algorithms
   Edition: III **Year:** 2013
   Publisher: Technical (ibid 5)

- **PERIODICALS**

1 Algorithms, Dec 2012, Vol. 5, Issue 4, http://www.mdpi.com/199-4893/5/4
2 IUP Journal of Computer Science, Vol. 7, No. 3, July 2013
3 IUP Journal of Computer Science, Vol. 7, No. 1, Jan 2013
4 SIGACT News, Vol. 44, No. 3, September 2013
5 International Journal of Computing and Applications, Vol. 8, No. 2, July-December 2013.

6 Proceedings of ESA 2014, July 2014, http://dimacs.rutgers.edu/~alantha/papers2/tsp4_arxiv.pdf
7 Internatioal Journal of Computer Trends and Technology (IJCTT) , Vol. 14 No. 1, Aug 2014, http://www.ijcttjournal.org/Volume14/number-1/IJCTT-V14P109.pdf
8 The IUP journal of Computer Science, Vol. 7, No. 2, April 2013, pp. 25-38.
9 International Journal of Computing Algorithm (IJCOA) Print ISSN: 2278-2397

LECTURES 1-2

WHAT ARE ALGORITHMS?

OBJECTIVE:

The objective of these lectures is to make the students understand the concept of algorithms and the basic technique used for analysis of algorithms such as recurrences, induction method and these techniques will be explained by considering Insertion Sort example. Analyzing an algorithm has come to mean predicting the resources that the algorithm requires.

CONTENTS:

- Introduction to Algorithms
- Analysis of Insertion Sort

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit I Section II Q1

OTHER ASSIGNMENTS:

1 ibid 1 Page No. 11 Ex 1.1 1-5
2 ibid 1 Page No. 29 Ex 2.2 1-10
3 ibid 3, Page No. 32-34
4 ibid 4, Page No. 50-52

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 5-29
2 ibid 4, Page No. 26-39

REFERENCE BOOKS:

1 ibid 2, Page No. 1-16
2 ibid 3, Page No. 1-19
3 ibid 5, Page No. 20-35

WEBSITE:

1 ftp://reports.stanford.edu/pub/cstr/reports/cs/tr/.../CS-TR-80-786.pdf

ARTICLES:

1 Patrick Prosser, "Exact Algorithm for Maximum Clique: A Comparative Study", Algorithms, July 2012, http://arxiv.org/pdf/1207.4616.pdf

2 The International Arab Journal of Information Technology, Vol. 11, No. 5, Sept 2015, http://ccis2k.org/iajit/PDF/vol.2,no.2/9-ElBachir.pdf

LECTURES 3-4

ASYMPTOTIC NOTATIONS

OBJECTIVE:

The objective of these lectures is to make student understand the importance of Growth of Functions. Growth of Function plays an important role in calculating the running time of an algorithm.

CONTENTS:

- Asymptotic Notations
  - Big-O notation
  - Big Omega Notation
  - Theta Notation
  - Small-o Notation
  - Small Omega Notation
- Comparison of Functions

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q2, 10,18,24,25,26,27, 28, 29, 30,31
2 Refer Unit I Section IV Q13,14

OTHER ASSIGNMENT:

1 ibid 1, Page No. 50, Q 3.1-1, 3.1-2, 3.1-9

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 43-53

REFERENCEBOOKS:

1 ibid 2, Page No. 34-62
2 ibid 3, Page No. 17-23
3 ibid 5, Page No. 25-29

WEBSITES:

1 www.cp.eng.chula.ac.th/~piak/teaching/algo/.../Asymptotic.pdf
2 www.personal.kent.edu/~rmuhamma/Algorithms/MyAlgorithms/intro.htm

LECTURES 5-7

RECURRENCE RELATIONS

OBJECTIVE:

The objective of these lectures is to explain the concept of recurrences and the various methods available to solve the recurrence relations such as replacing the variable or guessing method. Recurrence is an expression used to describe the running time of the algorithm that has recursive call in it.

CONTENTS:

- Introduction to Recurrences
- Solving Recurrences
    - Substitution Method
    - Iteration Method
    - Master Method

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q 3,5, 21,22, 31, 32,33
2 Refer Unit I Section III Q 5,8,9, 13,14,15, 16, 17,20,21
3 Refer Unit I Section IV Q 5-12, 18-25

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 74, Q 4.1-1, 4.1-2, 4.2-2, 4.2-3, 4.3-3, 4.3-10
3 ibid 2, Page No. 102, Q 2, 3, 6, 10-25
4 ibid 4, Page No. 135, Q5,6,8

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 62-75

REFERENCE BOOKS:

1 ibid 2, Page No. 79-96
2 ibid 3, Page No. 35-42
3 ibid 5, Page No. 80-96

WEBSITE:

1 www.cs.columbia.edu/~cs4205/files/CM2.pdf

ARTICLE:

1 R. Sudha, D Shivakumar," IRAF: Intensified Reputed ARAN Using Fuzzy Logic", The IUP Journal of Computer Sciences, July 2012, Vol. 6, No. 3, pp 24-34.

LECTURE 8

ASYMPTOTIC NOTATIONS & BASIC EFFICIENCY CLASSES

OBJECTIVE:

The lecture will help students understand the basic efficiency classes of the algorithm such as exponential, logarithm classes.

CONTENTS:

- Introduction to Efficiency Classes
  - Linear
  - Quadratic
  - Cubic
  - Logarithmic
  - Exponential

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q8,17,18,19,20, 23, 24, 25, 32
2 Refer Unit I Section III Q3, Q12

OTHER ASSIGNMENT:

1 ibid 1, Page No. 501, Q 21.1-1, 21.1-2, 21.2-1, 21.2-2, 21.3-2, 4.3-3, 5.5-5.10

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 43-53

REFERENCE BOOK:

1 ibid 2, Page No. 149-150
2 ibid 3, Page No. 209-232

WEBSITE:

1 www.cp.eng.chula.ac.th/~piak/teaching/algo/.../Asymptotic.pdf

ARTICLES:

1 RaghavKulkarni, "Gems in Decision Tree Complexity Revisited", SIGACT News, September 2013, Vol. 44, No. 3, pp- 42-55
2 Mohamed El BachirMenai and Mohamed Batouche "Solving the Maximum Satisfiability Problem Using an Evolutionary Local Search Algorithm" The International Arab Journal of Information Technology, Vol. 11, No. 5, Sept 2014, http://ccis2k.org/iajit/PDF/vol.2,no.2/9-ElBachir.pdf

LECTURES 9-11

SEARCHING AND SORTING

OBJECTIVE:

The objective of these lectures is to explain the various sorting algorithms like insertion, selection, merge sort etc and the searching techniques like linear and binary search. The lectures also explain the differences between various techniques in terms of the running time.

CONTENTS:

- Elementary sorting algorithms
  - Insertion Sort
  - Selection Sort
  - Bubble Sort
  - Merge Sort
- Searching Algorithms
  - Linear Search
  - Binary Search

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section III Q3,17, 18, 19
2 Refer Unit II Section II Q17, 24

OTHER ASSIGNMENT:

1 ibid 1, Page No. 501, Ex 2.1 Q1-10

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 16-29

2 ibid 3, Page No. 109-119

REFERENCE BOOK:

1 ibid 3, Page No. 65-107

WEBSITES:

1 http://cpp.datastructures.net/presentations/RadixSort.pdf
2 http://cpp.datastructures.net/presentations/BinarySearch.pdf
3 http://cpp.datastructures.net/presentations/InsertionSort.pdf
4 www.personal.kent.edu/~rmuhamma/Algorithms/MyAlgorithms/Sorting/sortingIntro.htm
5 http://mcqquestion.blogspot.in/2012/08/data-structures-and-algorithm-analysis_8955.html

ARTICLE:

1 Harish Rohil, Manisha, "Run Time Bubble Sort– An Enhancement of Bubble Sort", International Journal of Computer Trends and Technology (IJCTT), Vol. 14, No. 1, Aug 2014, pp36-38, http://www.ijcttjournal.org/Volume14/number-1/IJCTT-V14P109.pdf

LECTURE 12

DATA STRUCTURES FOR DISJOINT SETS

OBJECTIVE:

The lecture will help students gain an insight over how to represent and perform various operations on disjoint sets such as make, union and find set. Disjoint set data structures are used in various algorithms such as in minimum spanning trees etc.

CONTENTS:

- Data Structures for Disjoint Sets→ Introduction
  - Disjoint Sets operations
    - Make_Set(x)
    - Union(x,y)
    - Find_Set(x)
  - Finding out the connected components in a graph
  - Representation of Disjoint Sets
    - As Linked Lists
    - As Forests

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit II Section II Q8, 25, 26

OTHER ASSIGNMENT:

1 ibid 1, Page No. 501, Ex 21.1 Q1-3

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 561-573

REFERENCE BOOKS:

1 ibid 2, Page No. 149-150
2 ibid 3, Page No. 245-256

WEBSITE:

1 compgeom.cs.uiuc.edu/~jeffe/teaching/373/notes/09-unionfind.pdf

LECTURE 13

MERGE SORT

OBJECTIVE:

The objective of the lecture is to explain the students the basis of divide and conquer strategy with an insight of Merge Sort Algorithm and analysis of the same.

CONTENTS:

- Meaning of Divide and Conquer Strategy
  - Divide
  - Conquer
  - Combine
- Merge Sort
- Analysis of Merge Sort

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q9, 27, 35
2 Refer Unit II Section III Q1,12, 20, 21,45
3 Refer Unit II Section IV Q1, 20

OTHER ASSIGNMENT:

1 ibid 1, Page No. 37, Ex 2.3 Q1-9

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 30-39

REFERENCE BOOKS:

1 ibid 2, Page No. 27-32
2 ibid 3, Page No. 65-69

LECTURE 14

QUICK SORT

OBJECTIVE:

The objective of this lecture is to explain the students the new technique of sorting i.e. Quick Sort and describe time and space complexity and draw comparison between Merge Sort and Quick Sort.

CONTENTS:

- Quick Sort
- Analysis of Quick Sort
  - Best Case→ O(n lg n)
  - Worst Case→ $O(n^2)$
  - Average Case→ O(n lg n)
- Randomized version of Quick Sort
- Comparison between Merge Sort and Quick Sort

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q10, 28,36
2 Refer Unit II Section III Q5, 22
3 Refer Unit II Section IV Q6

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 173, Ex 7.1 Q.1-3
2 ibid 2, Page No. 109, Q 1, 2,3,4,5.10,11

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 170-190

REFERENCE BOOKS:

1 ibid 2, Page No. 103-109
2 ibid 3, Page No. 91-120

WEBSITES:

1 http://cpp.datastructures.net/presentations/DivideAndConquer.pdf
2 http://www.personal.kent.edu/~rmuhamma/Algorithms/MyAlgorithms/Sorting/quickSort.htm

LECTURE 15

MEDIAN AND ORDER STATISTICS

OBJECTIVE:

The objective of the lecture is to address the problem of selecting the I^{th} order statistic from a set of n distinct numbers and computing the minimum number of comparisons required to find simultaneous minimum and maximum from a given set.

CONTENTS:

- Median and order Statistics
- I^{th} order Statistic
- Computing simultaneous minimum and maximum in a given set
- Proving that at most 3n/2 comparisons are required for doing the same.

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit II Section III Q 13, 23, 24

OTHER ASSIGNMENT:

1 ibid 1, Page No. 215, Q 9.1-1, 9.1-2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 213-225

REFERENCE BOOKS:

1 ibid 2, Page No. 208-211
2 ibid 3, Page No. 111-115

LECTURES 16-17

HEAPS AND HEAP SORT

OBJECTIVE:

The objective of the lecture is to make students understand the concept of heaps and implementation of heap sort algorithm. Also, the analysis of the heap sort algorithm will be taught.

CONTENTS:

- Heaps
  - Concept
  - Implementation
- Heap sort
  - Meaning and algorithm
  - Implementation of algorithm
  - Algorithm runs with examples
  - Analysis of algorithms

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q7, 29
2 Refer Unit II Section III Q15,16
3 Refer Unit II Section IV Q3,14

OTHER ASSIGNMENT:

1 ibid 1, Page No. 153, Q 6.1-1, 6.1-7

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 151-162

REFERENCE BOOKS:

1 ibid 2, Page No. 32-33
2 ibid 3, Page No. 73-88

LECTURES 18-19

HASH TABLES

OBJECTIVE:

The lectures aim to acquaint the students with the concept of hashing and data structures like hash functions involved in hashing. Also, explain the collision resolution techniques such as open addressing, chaining etc. will be explained.

CONTENTS:

- Hash functions
  - Division
  - Folding
  - Mid Square functions
  - Extraction
  - Radix transformation
- Collision resolution
  - Open addressing
  - Chaining
  - Bucket addressing
- Hash functions for extendible files
  - Extendible hashing
  - Linear hashing

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q10
2 Refer Unit IV Section III Q11

OTHER ASSIGNMENT:

1 ibid 1, Page No. 261 Q11.2-1 to 11.2-4

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 253-277

WEBSITE:

1 http://cpp.datastructures.net/presentations/HashTables.pdf

ARTICLE:

1 G S Thyagaraju, U P Kulkarni, "Design and Implementation of Prototyping Simulator of Context Aware Application", The IUP Journal of Computer Sciences, Vol. 6, No. 4, October 2012, pp 7-34.

LECTURE 20

AVL TREES

OBJECTIVE:

The objective of this lecture is to explain the concept of AVL trees. Also explain the insertion and the deletion in the trees. In this lecture, various rotations such as RL, RR, LR, and LL will be taught.

CONTENTS:

- Definition
  - Definition
  - Maximum Height of an AVL Tree
  - Rotation in AVL trees

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q16
2 Refer Unit II Section III Q14, 21, 67,77

SUGGESTED READING:

REFERENCEBOOKS:

1 ibid 2, Page No. 231-237
2 ibid 3, Page No. 155-164

LECTURES 21-22

RED BLACK TREES

OBJECTIVE:

The objective of these lectures is to give an understanding of Red Black trees and the various operations that are possible on them such as insertion, deletion, rotation etc.

CONTENTS:

- Red Black trees
  - Definition
  - Search in RBT
  - Insertion in RBT
  - Deletion in RBT

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit II Section III Q8, 11

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 308-323

WEBSITE:

https://www.cs.auckland.ac.nz/~jmor159/PLDS210/niemann/s_rbt.htm

LECTURE 23

DYNAMIC PROGRAMMING

OBJECTIVE:

The lecture will help students understand how the dynamic programming technique is useful in solving problems. Students will get to know that dynamic programming applies to optimization problems in which a set of choices must be made in order to arrive at an optimal solution.

CONTENTS:

- Introduction to Dynamic Programming
- Comparison between Divide and Conquer Strategy and Dynamic Programming
- Elements of Dynamic Programming
    - Optimal sub structure
    - Overlapping sub problems

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit III Section II Q1, 3, 6,19,20,21, 22, 23

OTHER ASSIGNMENT:

1 ibid 1, Page No. 378, Q 15.2-1, 15.2-2, 15.2-3, 15.2-4
2 ibid 4, Page No. 340, Q 18.4-1, 18.4-1

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 359-390

REFERENCE BOOKS:

1 ibid 2, Page No. 289-290
2 ibid 3, Page No. 253

WEBSITE:

1. http://www.cs.berkeley.edu/~vazirani/algorithms/chap6.pdf
2. http://mcqquestion.blogspot.in/2012/08/data-structures-and-algorithm-analysis_8955.html

LECTURES 24-25

MATRIX CHAIN MULTIPLICATION

OBJECTIVE:

The objective of these lectures is to parenthesize a chain of matrices which can have a dramatic impact on the cost of evaluating the product. The lectures will help students in computing the optimal parenthesization for a given chain of matrices.

CONTENTS:

- Matrix Chain Multiplication
  - Structure of an optimal parenthesization
  - Finding out a recursive solution
  - Computing the optimal costs
  - Constructing an optimal solution

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q8, 9, 19, 24
2 Refer Unit III Section III Q1, 22, 23
3 Refer Unit III Section IV Q14,15,18,19,20

OTHER ASSIGNMENT:

1 ibid 1, Page No. 378, Q 15.2-5, 15.2-6

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 370-378

REFERENCE BOOKS:

1 ibid 2, Page No. 294-300

2 ibid 3, Page No. 255-260

WEBSITE:

1 http://gauss.cs.ucsb.edu/publication/hypersparse-ipdps08.pdf

LECTURES 26-27

LONGEST COMMON SUBSEQUENCE

OBJECTIVE:

The objective of the lectures is to make students find out the maximum-length common subsequence of given two sequences. This longest common subsequence can be useful in many applications like comparing the DNA of two different organisms.

CONTENTS:

- Longest Common Subsequence
  - Characterizing a longest common subsequence
  - Finding out a recursive solution
  - Computing the length of an LCS
  - Constructing an LCS

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section III Q 2, 11, 24, 25
2 Refer Unit III Section IV Q 9,10
3 Refer Unit III Section II Q20

OTHER ASSIGNMENT:

1 ibid 2, Page No. 310, Q 1

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 390-396

REFERENCE BOOKS:

1 ibid 2, Page No. 290-294
2 ibid 3, Page No. 262-270

LECTURE 28

OPTIMAL BINARY SEARCH TREES

OBJECTIVE:

The lecture will help students understand how to construct optimal binary search trees so as to minimize the expected search cost in a tree.

CONTENTS:

- Optimal Binary Search Trees
  - Introduction
  - Need for Optimal Binary Search Trees
  - Finding out the structure for optimal binary search tree
  - Computing a recursive solution
  - Computing the expected search cost
  - Constructing the optimal tree

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q 4,5
2 Refer Unit III Section II Q17, 25, 26

OTHER ASSIGNMENT:

1 ibid 1, Page No. 403, Q 15.5-1, 15.5-2

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 397-403
2 ibid 4, Page No. 500-550

WEBSITE:

1 web.ncyu.edu.tw/~wangch/course/972/alg/ital15.ppt

LECTURE 29

GREEDY ALGORITHMS

OBJECTIVE:

The lecture will help students understand the basic strategy being followed in greedy algorithms and why they are so called. They will get to know that a greedy algorithm always makes the choice that looks best at that moment.

CONTENTS:

- Introduction to Greedy Strategy
- Comparison between Dynamic Programming and Greedy Strategy
- Elements of Greedy Strategy
    - Optimal sub structure
    - Greedy Choice Property

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q 7
2 Refer Unit III Section III Q 13

OTHER ASSIGNMENT:

1 ibid 1, Page No. 427, Q 16.2-1,16.2-2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 414-423

WEBSITE:

1 www.cs.berkeley.edu/~vazirani/algorithms/chap5.pdf

LECTURE 30

ACTIVITY SELECTION PROBLEM

OBJECTIVE:

The objective of the lecture is to make students understand how to solve the problem of scheduling several competing activities that require exclusive use of a common resource.

CONTENTS:

- Activity Selection Problem
    - The optimal substructure of the activity-selection problem
    - Recursive greedy algorithm
    - Iterative greedy algorithm

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section III Q 3

2 Refer Unit II Section IV Q 9

OTHER ASSIGNMENT:

1 ibid 1, Page No. 421, Q 16.1-1, 16.1-2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 415-421

WEBSITE:

1 www.cs.ubc.ca/~liorma/cpsc320/files/weighted-activity-selection.pdf

ARTICLE:

1 Sanjay Jain, Kapil Sharma, "Identifying Optimum Inventory by using Genetic Algorithm with Special Reference to Automobile Sector", The IUP Journal of Computer Sciences, October 2012, Vol. 6, No. 4, pp 48-62.

LECTURE 31

HUFFMAN CODES

OBJECTIVE:

The objective of the lecture is to make students understand data compression using variable length Huffman codes.

CONTENTS:

- Huffman Codes
  - Introduction
  - Utility in Compression
  - Prefix Codes
  - Algorithm to compute variable length codes
  - Analysis to find out time complexity

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II 10,15,16
2 Refer Unit III Section IV Q 4

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 436, Q 16.3-3, 16.3-4
2 ibid 2, Page No. 322, Q 8

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 428-437

REFERENCE BOOKS:

1 ibid 2 Page No. 322-325
2 ibid 3, Page No. 277

WEBSITE:

1 www.cimt.plymouth.ac.uk/resources/**codes**/**codes**_u17_text.pdf

LECTURE 32

TASK SCHEDULING PROBLEM

OBJECTIVE:

The objective of the lecture is to make students aware that the complex problem of optimally scheduling unit-time tasks on a single processor with deadlines and penalties can be solved in a very simple manner using greedy algorithm.

CONTENTS:

- Task SchedulingProblem
  - The optimal substructure of the activity-selection problem
  - Recursive greedy algorithm
  - Iterative greedy algorithm

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit III Section II Q 5

OTHER ASSIGNMENT:

1 ibid 1, Page No. 446, Q 16.5-1, 16.5-2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 443-446

WEBSITE:

1 graal.ens-lyon.fr/~fvivien/EPIT/Slides/Schwiegelshohn.pdf

LECTURE 33

GRAPHS AND THEIR REPRESENTATION

OBJECTIVE:

The objective of lecture is to make student aware of graphs and their representation such as sparse matrix, adjacency list etc.

CONTENTS:

- Introduction to Graphs
  - Sparse Graphs
  - Dense Graphs
- Representation of Graphs
  - Adjacency list
  - Adjacency matrix
  - Incidence matrix
- Transpose of Graph

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit III Section IV Q 5

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 592, Q 21.1-1, 21.1-2
2 ibid 2, Page No. 418, Q 1, 2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 589-612

WEBSITE:

1 www.csbdu.in/econtent/DataStructures/Unit3-DS.pdf

LECTURES 34-35

SEARCH ALGORITHMS

OBJECTIVE:

The objective of the lectures is to learn how to search for some given values in a given graph. The students will get to know the utility of various search algorithms such as breadth first search and depth first search.

CONTENTS:

- Breadth First Search
  - What is BFS?
  - Algorithm for BFS
  - Analysis
  - Proof of correctness
- Depth First Search
  - What is DFS?
  - Algorithm for DFS
  - Analysis
  - Properties of DFS

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section IV Q 7,8.

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 592, Q 21.2-1, 21.2-2, 22.3-2
2 ibid 2, Page No. 419, Q 4(a)

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 589-603
2 ibid 4, Page No. 450, 467

REFERENCE BOOKS:

1 ibid 2, Page No. 375-382

2 ibid 3, Page No. 318-327

WEBSITE:

1 www.csc.lsu.edu/~kundu/dstr/2-depthFirst.pdf

LECTURES 36-37

DEPTH FIRST SEARCH APPLICATIONS

OBJECTIVE:

The objective of lectures is to learn various applications of DFS, topological sort with its implementation and complexity. The complexity of strongly connected graph and implementation of their algorithm will be discussed.

CONTENTS:

- Applications of DFS
  - Topological sort on a graph
    - Algorithm
    - Complexity
  - To find out Strongly Connected Components in a given graph
    - Algorithm
    - Running time

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit II Section III Q 6

OTHER ASSIGNMENT:

1 ibid 1, Page No. 393, Q 22.4-1, 22.5-1, 22.5-2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 549-557, 654-690

WEBSITE:

1 www.csc.lsu.edu/~kundu/dstr/2-depthFirst.pdf

LECTURES 38-39

SPANNING TREES

OBJECTIVE:

The objective of lectures is to gain an insight of the spanning trees and the greedy algorithms to find out the minimum spanning tree from a given graph.

CONTENTS:

- Introduction to Spanning trees
- Minimum Spanning Trees
- Kruskal's algorithm for finding out minimum spanning tree
    - Algorithm
    - Complexity
- Prim's algorithm for finding out minimum spanning tree
    - Algorithm
    - Performance of Prim's algorithm

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section III Q 7,8
2 Refer Unit III Section IV Q 1,2,3,4

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 629, Q 23.2-1,23.2-2
2 ibid 2, Page No. 419, Q 4(b), 5(a,b,c)

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 625-631

WEBSITE:

1 compgeom.cs.uiuc.edu/~jeffe/teaching/algorithms/notes/12-mst.**pdf**

LECTURES 40-41

SINGLE SOURCE SHORTEST PATH ALGORITHMS

OBJECTIVE:

The objective of lectures is to know how to calculate the shortest distance to a given node in a

graph from a single source vertex. Also bellman ford algorithm, negative weight cycles will be discussed.

CONTENTS:

- Introduction to shortest path problem
- Variants for solving shortest path problem
- Negative weight edges and cycles
- Algorithms for initializing the graph vertices and relaxing the graph edges.
- The Bellman-Ford algorithm for finding out shortest path
    - Algorithm
    - Complexity
    - Correctness
- Algorithm for Single source shortest paths in directed acyclic graphs
- Dijkstra's algorithm for single source shortest path problem
    - Algorithm
    - Performance
    - Correctness

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section III Q 6,9
2 Refer Unit III Section IV Q 6,7

OTHER ASSIGNMENT:

1 ibid 1, Page No. 654, Q 24.1-1, 24.1-2, 24.3-1,24.3-2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 643-664

REFERENCE BOOKS:

1 ibid 2, Page No. 399-409
2 ibid 3, Page No. 343-353

WEBSITE:

1 www.cs.princeton.edu/courses/archive/spr04/.../shortest-path.4up.pdf

LECTURE 42

ALL PAIRS SHORTEST PATH ALGORITHM

OBJECTIVE:

In this lecture the problem of finding shortest paths between all pairs of vertices in a graph is considered and solved. The lecture will focus on the algorithm used to solve the same.

CONTENTS:

- Algorithm to print all pairs shortest path provided the parent of each node is known.
- Concept of Shortest paths and matrix multiplication
- The Floyd-Warshall algorithm
    - The structure of the shortest path
    - Finding out a recursive solution to the problem
    - Computing the shortest paths
    - Constructing the shortest paths
- Transitive closure of a directed graph

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section III Q 10
2 Refer Unit III Section IV Q 5

OTHER ASSIGNMENT:

1 ibid 1, Page No. 699, Q 25.2-1, 25.2-2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 684-695

REFERENCEBOOKS:

1 ibid 2, Page No. 409-414
2 ibid 3, Page No. 357-364
3 ibid 5., Page No. 560-568

WEBSITE:

1 www.cs.umd.edu/~meesh/351/mount/.../lect24-floyd-warshall.pdf

LECTURE 43

STRING MATCHING

OBJECTIVE:

The objective of this lecture is to find all occurrences of a pattern in a text is a problem that arises frequently in text-editing documents. Efficient algorithms can help in solving the problem. String matching algorithms can be used for the same.

CONTENTS:

- Introduction to String Matching
- Notations used
- Naïve String Matching algorithm
    - Algorithm
    - Complexity

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit IV Section IV Q 3, 4

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 989, Q 32.1-1, 32.1-2
2 ibid 2, Page No. 431, Q 1

SUGGESTED READING:

TEXT BOOK:

1 ibid 1, Page No. 985-989

LECTURE 44

RABIN KARP ALGORITHM

OBJECTIVE:

The objective of the lecture is to learn Rabin Karp algorithm for string matching. This algorithm works well in practice and also generalizes to other algorithms for related problems.

CONTENTS:

- Rabin Karp Algorithm
    - Problem statement

- Horner's Rule
- Difficulty with the procedure
- Concept of valid and spurious hits
- Algorithm for Rabin_Karp_Matcher
- Time complexity for Rabin Karp algorithm

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section II Q 2, 21
2 Refer Unit IV Section III Q 1,16,17,18, 19, 20, 34,35
3 Refer Unit IV Section IV Q 1,2

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 994, Q 32.2-2
2 ibid 2, Page No. 431, Q 2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 990-994

WEBSITE:

1 www.cs.utexas.edu/~plaxton/c/337/05f/slides/**String**Matching-1.pdf

LECTURE 45

FINITE AUTOMATON

OBJECTIVE:

Many string-matching algorithms build a finite automaton that scans the text string for all occurrences of the pattern. The objective of the lecture is to learn how to build such an automaton.

CONTENTS:

- Introduction to finite automaton
- String matching automaton
  - The algorithm for finite automation matcher
  - Performance of the algorithm
- Computing the transition function

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section III Q 7,17, 21, 23,25

2 Refer Unit IV Section IV Q 6

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 1002, Q 32.3-1, 32.3-2
2 ibid 2, Page No. 431, Q 3

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 995-1002

REFERENCE BOOKS:

1 ibid 2, Page No. 426
2 ibid 3, Page No. 438

WEBSITE:

1 b.ecs.baylor.edu/faculty/cho/3360/Lecture5_Matching.pdf

LECTURE 46

KMP ALGORITHM

OBJECTIVE:

The objective of the lecture is to learn a linear time string matching algorithm. This algorithm avoids the computation of the transition function. Also, various algorithms like KMP etc. will also be discussed.

CONTENTS:

- KMP algorithm for string matching
  - The prefix function for a pattern
  - Algorithm for computing prefix function
  - Algorithm for KMP_Matcher
  - Running time analysis for the algorithm
  - Correctness of the prefix function computation
- Correctness of KMP algorithm

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q18
2 Refer Unit IV Section III Q 2, 22, 23
3 Refer Unit IV Section IV Q 7

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 1011, Q 32.1-4
3 ibid 2, Page No. 431, Q 5
4 ibid 4, Page No. 567, Q8

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 1002-1011

WEBSITES:

1 www.cs.ubc.ca/~hoos/cpsc445/Handouts/kmp.pdf
2 www.personal.kent.edu/~rmuhamma/Algorithms/MyAlgorithms/StringMatch/kuthMP.htm

LECTURES 47 - 48

NP - COMPLETENESS

OBJECTIVE:

All the algorithms studied so far have been polynomial-time algorithms. In these lectures some algorithms of non-polynomial time nature will be discussed.

CONTENTS:

- Classes P and NP
- What is NP-completeness?
- What are Polynomial time solvable problems?
- Concept of Polynomial-time verification
- Hamiltonian cycles
- Verification algorithms
- Reducibility
- NP-completeness proofs

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section II Q 3,5
2 Refer Unit IV Section II Q11-14

OTHER ASSIGNMENT:

1 ibid 1, Page No. 1060, Q 34.1-1, 34.2-1, 34.3-7, 34.4-2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 1067-1086

REFERENCE BOOKS:

1 ibid 2, Page No. 438-442
2 ibid 3, Page No. 459-464
3 ibid 5, Page No. 569-587

LECTURES 49-51

NP-COMPLETE PROBLEMS

OBJECTIVE:

In these lectures, the problem of finding shortest paths between all pairs of vertices in a graph is considered and solved. The lectures will focus on the algorithm used to solve the same.

CONTENTS:

- NP-complete problems
  - The Clique Problem
  - The vertex-cover problem
  - The Hamiltonian-cycle problem
  - The traveling-salesman problem

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section II Q 9,10, 22, 23,33,34
2 Refer Unit IV Section III Q 3,4,5,6,9,16,17,18

OTHER ASSIGNMENT:

1 ibid 1, Page No. 1060, Q 34.5-1, 34.5-2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 1053-1089

REFERENCE BOOKS:

1 ibid 2, Page No. 443-453
2 ibid 3, Page No. 465-475

ARTICLES:

1 Mohamed El BachirMenai, Mohamed Batouche,"Solving the Maximum Satisfiability Problem Using an Evolutionary Local Search Algorithm" The International Arab journal of Information technology, Vol. 2, No. 2, Sept 2014, pp-154-161,http://ccis2k.org/iajit/PDF/vol.2,no.2/9-ElBachir.pdf

2 Alantha Newman, "An Improved Analysis of the Mömke-SvenssonAlgorithm for Graph-TSP on SubquarticGraphs", Proceedings of ESA 2015, July 2015, http://dimacs.rutgers.edu/~alantha/papers2/tsp4_arxiv.pdf

LECTURE PLAN

DATA WAREHOUSING
AND
DATA MINING

MCA - 204

MCA COURSE OUTLINE
DATA WAREHOUSING AND DATA MINING - MCA 204
MCA IV SEMESTER

L - 4 Credits – 04

OBJECTIVE:

The purpose of this course is to enable the students to introduce data warehousing that represents an ideal vision of maintaining a central repository of all organizational data and the concepts related to data mining which is a process of discovery of knowledge hidden in massive data stored in data warehouse.

INTERNAL ASSESSMENT AND ASSIGNMENT **(40 marks)**
1. Class Test-I - (Written Test) (15 marks)
2. Class Test-II - (Written Test) (15 marks)
3. Class Assessment + Attendance (10 marks)

COURSE CONTENTS:

A. THE COMPELLING NEED FOR DATA WAREHOUSING (11 Hours)
- Escalating Need for strategic information
- Failures of Past Decision-Support Systems
- Operational versus Decision-Support Systems
- Features and Components of Data Warehouses
- Defining Business Requirements
- OLAP Operations

B. PRINCIPALS OF DIMENSIONAL MODELING (10 Hours)
- STAR Schema
- Updates to the Dimension tables
- Snowflake schema
- Families of STARS
- OLAP Servers

C.DATA MINING (10 Hours)
- Meaning of data mining
- KDD
- Data Processing
- Data Mining Primitives

D. DATA MINING QUERY LANGUAGE (11 Hours)
- Query Language
- Cluster Analysis
- Data mining techniques
- Data mining applications

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of Data Warehousing & Data Miningstudents are advised to go through the material for thorough understanding of the subject.

- **TEXT BOOK**

1. **Author's Name(s):** Paul Raj Ponniah
   Title: Data Warehousing Fundamentals
   Edition: Second **Year**: 2014
   Publisher: Wiley India (ibid 1)

- **REFERENCE BOOKS**

1. **Author's Name(s):** Jiawei Han, Micheline Kamber, Jian Pei
   Title: Data Mining Concepts and Techniques
   Edition: III **Year:** 2012
   Publisher: Morgan Kaufmann (ibid 2)

2. **Author's Name(s):** G.K. Gupta
   Title: Introduction to Data Mining through Case Studies
   Edition: III **Year:** 2015
   Publisher: PHI (ibid 3)

3. **Author's Name(s**): K.P Soman, Shyam Diwakar, V.Ajay
   Title: Insight into Data Mining Theory and Practice
   Edition: Sixth **Year:** 2012
   Publisher: PHI (ibid 4)

4. **Author's Name(s):** Efraim Turban, Ramesh Sharda, Dursun Delen & David King
   Title: Business Intelligence: A Managerial Approach
   Edition: II **Year:** 2013
   Publisher: Pearson
   (ibid 5)

5. **Author's Name(s): Alex Berson and Stephan J. Smith**
   Title: Data Warehousing, Data Mining and OLAP
   Edition: II **Year:** 2014
   Publisher: McGraw Hill Education(India) Pvt. Ltd. (ibid 6)

- **PERIODICALS**

1 International Journal of Data Analysis and Information System, Vol. 3, Number 1, Jan-June 2011,
2 International Journal of Data Warehousing, Vol. 3 No.1, Jan- June 2011
3 BVICAM's International Journal of Information and Technology, July- December 2011,Vol. 3, No.2
4 International Journal of Data Analysis and Information System ,Vol. 4, Number 1, Jan-June 2012
5 International Journal of Data Warehousing, Volume 6, Number 2, December 2013
6 IFRSA International Journal of Data Warehousing & Mining Vol. 4, Issue 2, May 2014
7 The IUP Journal of Computer Sciences, Vol. VIII, No.2, July 2014
8 The IUP Journal of Computer Sciences, Vol. IX, No.1, July 2015.

UNIT-I

LECTURES 1-2

NEED OF DATA WAREHOUSING

OBJECTIVE:

Massive data being produced by business houses today are storehouse of information that can give competitive edge to the organization. These lectures explain the desperate need of strategic information and the importance of data warehousing.

CONTENTS:

- Compelling need for data warehousing
  - Escalating need for Strategic Information
    - The Information Crisis
    - Technology trends
    - Opportunities and Risks
  - Failures of Past Decision-Support Systems
  - Operational Versus Decision-Support Systems
  - Data Warehousing-The only viable solution
  - Meaning of Data Warehouse
  - Definition of Data Warehouse

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section 2 Q 1-11
2 Refer Unit I Section 3 Q 1-4, 41-44

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 1-14

REFERENCE BOOK:

1 ibid 5,Page No. 29-74

ARTICLES

1 M. Asif Naeem, Noreen Jamil, "An Efficient Stream-based Join to Process End User Transactions in Real-Time Data Warehousing", Journal of Digital Information Management, Vol. 12, No. 3, June 2014, pp 201-215.
2 Progress in Business Intelligence System Research: A literature Review, Rina Fitriana, Eriyatno, Taufik Djatna, International Journal of Basic & Applied Sciences IJBAS-IJENS Vol. 11 No. 03, pp 96-100.
3 Shija Gao, Mobile Decision Support Systems Research: A Literature Analysis, Journal of Decision System, Vol. 22, 2013, pp 10-27

WEBSITES:

1 http://www.exforsys.com/tutorials/msas/introduction-to-data-warehousing.html
2 http://www.infogoal.com/datawarehousing/overview.htm

LECTURES 3-6

BUILDING BLOCKS OF A DATAWAREHOUSE

OBJECTIVE:

The objective of these lectures is to understand the architecture of data warehouse.

CONTENTS:

- Building blocks of Data Warehouse
  - Features of Data warehouse
    - Subject oriented data
    - Integrated data
    - Time-Variant data
    - Nonvolatile data
    - Data Granularity
  - Comparative study of Data warehouse and Data Mart
    - Top down versus bottom up approach
  - Components of Data warehouse

        - Source data component
            - Production data
            - Internal data
            - Archived data
            - External data
        - Data staging component
        - Data storage component
        - Information delivery component
        - Metadata component
        - Management and control component
    - Types of metadata in Data warehouse
        - Operational metadata
        - Extraction and transformation metadata
        - End-user metadata

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section 2 Q11-30, 44-45
2 Refer Unit I Section 3 Q 5-8

SUGGESTED READING:

TEXT BOOK:

1 ibid 1, Page No. 19-36

REFERENCE BOOK:

1. ibid 5, Page No. 38-47

ARTICLES:

1. NakulVachhrajani "Defining a Database Upgrade Design Methodology "National Journal of System and IT, Volume 4, No.1, June 2011, Page No. 88-108.
2. DeepshikhaAggarwal "A Novel Data Warehouse Architecture for Improvement in the Extraction,Cleaning and Loading of Optimized data in a Data Warehouse" IFRSA International Journal of Data Warehousing & Mining Vol 4 issue2 May 2014 pp 95- 102 "http://www.ifrsa.org/images/iijdwmvol4issue2/5%20five.pdf

LECTURE 7

DEFINING THE BUSINESS REQUIREMENTS

OBJECTIVE:

The type of information needed by various organizations holds the key to building a data warehouse. This lecture discusses why and how defining requirements for a data warehouse is different from that of a database and what is the role of business dimensions in this process.

CONTENTS:

- Dimensional Analysis
    - Usage of information unpredictable
    - Dimensional nature of business data
    - Examples of business dimensions

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section 2 Q21-30
2 Refer Unit I Section 3 Q1-12
3 Refer to Unit 1 Section 2 Q46-50

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 89-106

WEBSITES:

1 http://www.infogoal.com/datawarehousing/requirements.htm
2 http://www.ifs.tuwien.ac.at/~bruckner/pubs/amcis2001_requirements.pdf

LECTURES 8-11

OLAP IN THE DATA WAREHOUSE

OBJECTIVE:

The objective of these lectures is to perceive the unqualified demand for online analytical processing (OLAP) and understand what drives this demand.

CONTENTS:

- Demand for Online Analytical Processing
    - Need for Multidimensional Analysis
    - Fast Access and Powerful Calculations
    - Limitations of other Analysis Methods
    - OLAP
    - OLAP Definitions and Rules
        - Multidimensional Conceptual view
        - Transparency
        - Accessibility
        - Consistent Reporting Performance

        - Client/Server Architecture
        - Generic Dimensionality
        - Dynamic Sparse Matrix Handling
        - Multi-user Support
        - Unrestricted Cross-dimensional Operations
        - Intuitive Data Manipulation
        - Flexible Reporting
        - Unlimited Dimensions and Aggregation Levels
    - OLAP Characteristics
- Major features and functions of OLAP
    - General features
    - Dimensional Analysis
    - Hyper cubes
    - Drill-Down and Roll-up
    - Slice-and-Dice or Rotation
    - Uses and Benefits
        - Increased productivity
        - Inherent flexibility
        - Benefit for IT developers
        - Self-sufficiency of users
        - Faster delivery
        - More efficient operations
        - Ability to model real-world challenges

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section 2 Q31-35
2 Refer Unit I Section 3 Q18-28,34-41, Q46-50

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 343-363

REFERENCE BOOK:

1 ibid 2, Page No. 125-178

ARTICLES:

1 DeepshikhaAggarwal "A Novel Data Warehouse Architecture for Improvement in the Extraction, Cleaning and Loading of Optimized data in a Data Warehouse" IFRSA International Journal of Data Warehousing & Mining Vol. 4, Issue2, May 2014, pp. 95- 102 "http://www.ifrsa.org/images/iijdwmvol4issue2/5%20five.pdf

2 Hoda A. Abdelhafez, "Advanced Data Warehouse in Telecommunication Industries", International Journal of Data Analysis and Information System, Vol. 4, No. 1, Jan-June 2012, pp. 1-9

WEBSITES:

1 http://www.infogoal.com/datawarehousing/olap.htm2
2 "Introduction to OLAP",http://www.dwreview.com/OLAP/Introduction_OLAP.html
3 "OLAP and Data Warehouses",http://msdn.microsoft.com/en-us/library/aa197702(SQL.80).aspx
4 "Hypercubes",http://www.thefreedictionary.com/hypercubes
5 "Data Warehousing Technology: Focus on clinical warehouse", http://ycmi.med.yale.edu/nadkarni/Warehouse_Fr.htm
6 JavierCabrerizoaJuan,AntonioMorente-MolinerabIgnacio, Javier Pérezc JavierLópez-GijóndEnriqueHerrera-Viedmabe, "A Decision Support System to Develop a Quality Management in Academic Digital Libraries", Information Sciences Vol. 323, 1, December 2015, Pages 48-58.
7 Keller, J. (2013). DARPA Launches PPAML Artificial Intelligence Program to move Machine Learning Forward. Military & Aerospace Electronics. [online] Available at: shttp://www.militaryaerospace.com/articles/2013/03/DARPA-machine-learning.html

UNIT-II

LECTURES 12-16

PRINCIPLES OF DIMENSIONAL MODELING

OBJECTIVE:

Dimension modeling is a logical design technique to structure the business dimensions and the metrics that are analyzed along these dimensions. These lectures introduce dimension modeling with various examples.

CONTENTS:

- Dimension Modeling Basics
- E-R Modeling versus dimensional modeling
- STAR Schema
  - Review of a simple STAR schema
  - Inside a Dimension table
  - Inside the fact table
  - The fact less fact table
  - Data Granularity
- STAR Schema Keys
  - Primary keys

- Surrogate keys
- Foreign keys

- Advantages of STAR Schema
  - Easy for users
  - Optimizes navigation
  - Most suitable for query processing
  - STAR join and STAR index

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section 2 Q1-11
2 Refer Unit II Section 3 Q1-3

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 203-223

WEBSITES:

1 "Star Schema", http://en.wikipedia.org/wiki/Star_schema
2 "Well formed data warehouse Structures", http://sunsite.informatik.rwth-aachen.de/Publications/CEUR-WS//Vol-77/02_Schneider.pdf

LECTURES 17-21

ADVANCED DIMENSIONAL MODELING

OBJECTIVE:

These lectures explain advance topics of dimensional modeling like slowly changing dimensions, understanding of large dimensions and techniques to deal with them.

CONTENTS:

- Updates to the Dimension tables
  - Slowly changing dimensions
  - Type 1 changes: Correction of errors
  - Type 2 changes: Preservation of errors
  - Type 3 changes: Tentative Soft Revisions
- Miscellaneous dimensions
  - Large dimensions
  - Rapidly changing dimensions
  - Junk dimensions
- The snowflake schema

    - Options to normalize
    - Advantages
    - Disadvantages
    - When to snowflake
- Aggregate fact tables
    - Fact table sizes
    - Need for aggregates
    - Aggregate fact tables
    - Aggregation options
- Families of stars
    - Snapshot and Transaction tables
    - Core and custom tables
    - Supporting enterprise value chain or value circle
    - Conforming dimensions
    - Standardizing facts
    - Summary of family of STARS
- Design and Construction of Data Warehouse
    - Framework
    - Architecture
- OLAP Models
    - Overview of Variations
    - The MOLAP Model
    - The ROLAP Model
    - ROLAP versus MOLAP
- OLAP Implementation Considerations
    - Data design and preparation
    - Administration and performance
    - OLAP platforms
    - OLAP tools and products
    - Implementation steps
- Data warehouse Implementation Tools and Techniques

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section 2 Q12-26
2 Refer Unit II Section 3 Q 4-7,17-26

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No.225-254 ,364-374

WEBSITES:

1 " Snowflake Schema Architecture", http://etl-tools.info/en/bi/datawarehouse_snowflake-schema.htm

UNIT-III

LECTURES 22-31

DATA MINING

OBJECTIVE:

Data mining is a collection of techniques for efficient automated discovery of previously unknown, valid, novel, useful and understandable pattern in large databases. These lectures introduce data mining, its life cycle and few techniques of data mining.

CONTENTS:

- Data Mining
  - Meaning of data mining
  - History of data mining
  - Lifecycle of data mining
    - Data preprocessing
    - Algorithm selection
    - Data processing
    - Model construction and evaluation
    - Discovering knowledge
    - Taking action
  - Knowledge Discovery process
    - Define business objectives
    - Prepare data
    - Perform data mining
    - Evaluate results
    - Present discoveries
    - Incorporate usage of discoveries
  - Pattern Detection
  - Data mining strategies
    - Classification
    - Association
    - Clustering
    - Estimation
    - Novelty detection
    - Sequence detection
  - OLAP versus data mining
  - Data mining and data warehouse
  - Data mining Functionalities
    - Characterization and Discrimination
    - Classification and Prediction
    - Cluster Analysis
    - Outlier Analysis
    - Evolution Analysis

- Classification Systems
  - Classification by Decision Tree Induction
  - Bayesian Classification
  - Rule Based
  - Support Vector Machines
- Data Processing
  - Data Summarization
  - Data Cleaning
  - Data Integration and Transformation
  - Data Reduction
- Data Mining Primitives

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section 2 Q1-19
2 Refer Unit III Section 3 Q1-11,14-17

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 399-408

REFERENCE BOOKS:

1 ibid 2, Page No. 1-33, 83-123
2. ibid 3, Page No. 1-23
3 ibid 4, Page No 1-19
4 ibid 5, Page No. 131-156

ARTICLES:

1 M. Ravisankar, P. Premchand, M. Srinivas, "Multi-relational Data Mining in Medical History: A Review", International Journal of Data Warehousing, Vol. 3 No. 1, Jan- June 2011, pp 7-72.
2 S. Narmadha, S. Vijayarani, "Privacy Preserving Data Mining based on Ant Colony Optimization", International Journal of Data Warehousing, Vol. 3 No. 2, December 2013, ISSN: 0975-6124, pp 87-96.
3 A.Pravin, Dr. S. Srinivasan, "Detecting of Software Bugs in Source code using Data Mining Approach", National Journal of System and Information Technology, Vol. 6 No. 1, June 2013, ISSN: 0974-3308, pp 1-8.
4 Pooja Mauskar, Manisha Naoghare, Amruta Kurdukar,"Improving Cluster Quality for Prediction of user Behaviors using CTMSP Mining", IFRSA International Journal of Data Warehousing & MiningVol 4|issue4| Nov. 2014, pp 216-221. http://www.ifrsa.org/images/iijdwmvol4issue4/2%20two.pdf

UNIT-IV

LECTURES 32-43

DATA MINING QUERY LANGUAGE

OBJECTIVE:

The objective of these lectures is to make the students understand the various techniques of Data Mining and their practical applications.

CONTENTS:

- Data Mining query Language
  - Introduction
  - Commands
- Cluster Analysis
  - Definition
  - Types of data in Cluster Analysis
  - Partitioning Methods
  - Hierarchical Methods
    - Agglomerative and divisive Hierarchical Clustering
    - BIRCH
    - ROCK
    - CHAMELEON
  - Density Based Methods
    - DBSCAN
    - OPTICS
    - DENCLUE
  - Grid Based Methods
    - Statistical Information Grid
    - Clustering using Wavelet Transformation
  - Model Based Methods
    - Expectation Minimization
    - Conceptual Clustering
    - Neural Network Approach
  - Data mining techniques
    - Cluster detection
    - Decision trees
    - Memory based reasoning
    - Link analysis
    - Associations discovery
    - Sequential pattern discovery
    - Similar time sequence discovery
    - Neural networks
    - Genetic algorithms

- Data mining applications
  - Retail industry
  - Telecommunication industry
  - Banking and finance
- Benefits of data mining

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section 2 Q1-16
2 Refer Unit IV Section 3 Q 1-33

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 408-426

REFERENCE BOOKS:

1 ibid 2, Page No. 443-483
2 ibid3, Page No. 174-230
3 ibid 4, Page No. 53-112

ARTICLES:

1 Pooja Mauskar, Manisha Naoghare, Amruta Kurdukar,"Improving Cluster Quality for Prediction of user Behaviors using CTMSP Mining", IFRSA International Journal of Data Warehousing & Mining, Vol.4, Issue4, Nov. 2014,pp. 216-221 http://www.ifrsa.org/images/iijdwmvol4issue4/2%20two.pdf
2 Parul Gupta, A.K. Sharma, "A Framework for Hierarchical Clustering Based on Indexing in search engines", BVICAM's International Journal of Information and Technology, July - December 2011, Vol. 3, No.2,pp 1-6.
3 Mohd. Ghouse Mohiuddin, "Integration of Data Mining Techniques with Database Management System", The IUP Journal of Computer Sciences, Vol. 6, No.3, July 2012, pp 7-23
4 S. Namratha, S. Vijayarani, "Privacy Preserving Data Mining based on Ant Colony Optimization", International Journal of Data Warehousing, Volume 6, Number 2, December 2013, pp 87-96
5 M. Mohammed Mustafa, "Technology Enhancement in Learning", International Journal of Data Warehousing, Vol.6, Number 2, December 2013, pp. 97-102.
6 S. Taruna, Deepika Singh, Chitra Garg, "Classification of Doctors Prescribing Behaviour using Data Mining Technologies", International Journal of Data Warehousing, Volume 6 Number 2, December 2013, pp 103-108
7 C Bhuvneshwar, P PAruna and D Longathan , "Lung Disease Classification Using Shape Based Feature Extraction Technique", The IUP Journal of Computer Sciences, Vol. VIII, No.2, April 2014,pp41-48

8 Vibhooti Markandey, "Tracking Medicine Purchase Trends using Data Mining", The IUP Journal of Computer Sciences, Vol. IX, No.1, July 2015, pp 47-56.
9 "Data Mining Classification Algorithms: A Comparative Study on Educational Data" in National Seminar, Techno Tryst 2014 on Novel Paradigms of Software Engineering and data base Technology on 1st March 2014 at Delhi Institute of Advanced Studies, Delhi.
10 "Mining Students' Data for Performance Prediction" in International Conference on Advanced Computing & Communication Technologies (ACCT), 2014 on 8th February 2014 with IEE Explore.
11 "Educational Data Mining: An Exemplary Approach to Improve Higher Education" in International Conference on "Innovation Strategies for Contemporary Management" at Om Institute of Technology and Management, Hisar on 24th March, 2012.

WEBSITE:

1 "Data Mining Techniques", http://www.thearling.com/text/dmtechniques/dmtechniques.htm

LECTURE PLAN

ADVANCED COMPUTER NETWORKS

MCA-206

COURSE OUTLINE
MCA-IV SEMESTER
ADVANCED COMPUTER NETWORKS - MCA 206

L - 4 Credits 04

OBJECTIVE:

The objective of this course is to enable the students to know about the advanced concepts related to networking. It helps the students to understand the various protocols which are used for routing the data/message across internet. It introduces IPv4 protocol along with the changes made to this existing Internet protocol leading to IPv6. Later part of the course focuses on more sophisticated network concepts of mobile networks, multicasting and cryptography.

INTERNAL ASSESSMENT AND ASSIGNMENT **(25 marks)**
1. Class Test- (Written Test) (15 marks)
2. Class Assessment + Attendance (10 marks)

COURSE CONTENTS:

A. WHAT ARE THE BASIC COMPUTER NETWORKING CONCEPTS (LAYERS, PROTOCOLS) **(10 Hours)**

- Overview of computer network
- Seven- layer architecture
- TCP/IP suite of protocol, etc,
- Mac protocol for high speed LANS, MAN's & WIRLESS LANs (FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet etc)
- Fast access technologies. (ADSL, cable Modem Etc.),
- Wi Fi
- Wimax.

B. IPV6 AND ATM **(12 Hours)**

- IPV6-Basic protocol,
- Extension & option
- Support for QS
- Security
- Neighbor discover
- Auto-configuration
- Routing
- Change to other protocols
- Application programming interface for IPV6.6 bone.
- ATM: Introduction, ATM reference Model, AAL layers, AAL0, AA1, AAL2, AAL3/4, AAL5

C. MOBILITY and IP MULTICASTING **(10 Hours)**

- Mobility in network, mobile
- Security related issues.
- Multicasting routing protocols
- Address assignment, Session discovery, etc.

D. TCP EXTENSION AND NETWORK SECURITY **(10 Hours)**

- TCP extensionsfor high – speed networks
- Transaction – oriented application
- Other new option in TCP
- Network security at various layers
- Secure-HTTP, SSP, ESP
- Authentication header
- Key distribution protocols
- Digital signatures
- Digital certificates

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of Advanced Computer Networks and students are advised to go through the material for thorough understanding of the subject.

- **TEXT BOOK**

1. **Author's Name(s):** Behrouz A. Forouzan
   Title: TCP/IP Protocol Suite
   Edition: 4th **Year:** 2011
   Publisher: Tata McGraw Hill (ibid 1)

- **REFERENCE BOOKS**

1. **Author's Name(s):** Douglas E. Comer
   Title: Internetworking with TCP/IP, Volume 1: Principles, Protocols, and Architecture
   Edition: 5th**Year:** 2012
   Publisher: Prentice-Hall of India (ibid 2)

2. **Author's Name(s):** Behrouz A. Forozoun
   Title: Data Communication and Networking
   Edition: 5th**Year:** 2012
   Publisher: Tata McGraw Hill (ibid 3)

3. **Author's Name(s):** Atul Kahate
   Title: Cryptography and Network Security
   Edition: 3rd **Year:** 2013
   Publisher: Tata McGraw Hill (ibid 4)

4. **Author's Name(s):** William Stallings
   Title: Cryptography and Network Security: Principles and Practices
   Edition: 5th**Year:** 2011
   Publisher: Pearson (ibid 5)

- **PERIODICALS**

1. Computer Networks Elsevier, Volume 55, Issue 4, March 2011
2. Computer Networks Elsevier, Volume 110, December 2016
3. Communications Magazine, IEEE , Volume 49 , Issue 4, April 2011
4. Computer Networks Elsevier, Volume 55, Issue 8, June 2011
5. International Journal of Advanced Networking and Application, Vol. 6, Issue 1, July-Aug 2014, http://www.ijana.in/volume6issue1.php#one
6. Proceedings of SIGCOMM 2014, Computer Communication Review, Volume 44 Issue 5, October 2014

7. IEEE Communications Magazine, December 2014, Vol. 52, No. 12, http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=35
8. Communications Magazine, IEEE, Volume 52 , Issue 12, December 2014
9. IEEE Communications Magazine, Volume 54, Issue 7, July 2016

UNIT - I

LECTURE 1

OVERVIEW OF COMPUTER NETWORK

OBJECTIVE:

The objective of the lecture is to make the students review the basic concepts of networking that include elements of a communication system, seven layer architecture and its functions. It also explains the addressing used in various layers of TCP/IP protocol suite.

CONTENTS:

- Introduction
- OSI Model
  - Layered Architecture
  - Layer-to-Layer Communication
  - Encapsulation
  - Layers in the OSI Model
- TCP/IP Protocol Suite
  - Comparison between OSI and TCP/IP Protocol Suite
  - Layers in the TCP/IP Protocol Suite
- Addressing
  - Physical Addresses
  - Logical Addresses
  - Port Addresses
  - Application-Specific Addresses

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section II Q1,2,3,4
2 Refer Unit 1 Section IIIQ1,2,11

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 43, Q 8, 9, 10, 11
2 ibid 2, Page No. 226, Q 11, 12

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 19-40

REFERENCE BOOK:

1 ibid 3, Page No.32-46

LECTURES 2-3

MAC PROTOCOL FOR HIGH SPEED LANs

OBJECTIVE:

The objective of these lectures is to have an overview of various technologies under Wired LANs. It explains the various IEEE standards of different LAN technologies along with their access mechanism.

CONTENTS:

- Wired Local Area Network
  - IEEE Standards
  - Frame Format
  - Access Mechanism
    - CSMA/CD
- Addressing
  - Unicast
  - MultiCast
  - Broadcast
- Ethernet Evolution
  - Standard Ethernet (IEEE 802.3)
  - Iso Ethernet (IEEE 802.9e)
  - Fast Ethernet (IEEE 802.3u)
  - Gigabit Ethernet (IEEE 802.3z)
  - Ten-Gigabit Ethernet

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section II Q7, 8, 10, 12
2 Refer Unit 1 Section III Q6,7

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 43, Q 13, 16
2 ibid 2, Page No. 418, Q 1, 2, 3,4,5,6
3 ibid 2, Page No. 359, Q1, 2, 4, 5

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 47-59

REFERENCE BOOKS:

1 ibid 2, Page No. 15-24
2 ibid 3, Page No. 362-383

ARTICLE:

1 M. Aykut Yigitel, Ozlem Durmaz Incel , Cem Ersoy, "QoS-aware MAC Protocols for Wireless Sensor Networks: A Survey", Computer Networks Elsevier, Volume 55, Issue 8, June 2011, pp. 1982–2004.

LECTURES 4-5

TOKEN RING AND WIRELESS LANS

OBJECTIVE:

The objective of theses lectures is to explain the high-speed LAN technology like Token Ring, its frame format and its working. It explains wireless LANs technology like 802.11 and Bluetooth. It helps the student understand the working of wireless devices and the concept of hidden and exposed station issues.

CONTENTS:

- Token ring(IEEE 802.5)
  - Access Method
  - Addressing
  - Electrical Specification
  - Data rate
  - Frame format
  - Implementation
- Wireless LANs
  - IEEE 802.11
    - Architecture
    - MAC Sublayer
    - CSMA/CA and NAV
    - Addressing
    - Hidden and Exposed Station Problem
  - Bluetooth (IEEE 802.15)

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section II Q18, 19
2 Refer Unit 1 Section III Q15, 19

OTHER ASSIGNMENT:

1 ibid 2, Page No. 419, Q 1,2,8,10,11

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 59-70

REFERENCE BOOK:

1 ibid 3, Page No. 436-457

ARTICLE:

1 Paul Ferrand, Mustapha Amara, Stefan Valentin, Maxime Guillaud,"Trends and challenges in wireless channel modeling for evolving radio access", IEEE Communications Magazine, Volume 54, Issue 7,July 2016, Page(s):93 - 99

LECTURES 6-8

METROPOLITIAN AREA NETWORK

OBJECTIVE:

The objective of these lectures is to explain about various MAN Technologies, like FDDI, DQDB and HIPPI. These topic help students understand the topology used while establishing Metropolitan Area Network. The architecture of the wireless LAN and their frame format will be discussed.

CONTENTS:

- Fiber Distributed Data Interface
  - Architecture
  - Specification
  - Dual Ring Topology
  - Physical Connections
  - Fault Tolerance
  - Frame Format
  - MAC Operation

- TTR Protocol
- Distributed Queue Dual Bus
  - Architecture
  - Traffic
  - Mode of Access
  - Frame Structure
  - Counter
- HIPPI
  - Architecture
  - Frame Format
  - MAC Operation

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section II Q10, 22, 23
2 Refer Unit 1 Section III Q 11,12, 13,14, 18

OTHER ASSIGNMENT:

1 ibid 2, Page No. 543, Q 2, 4, 5,6,11

SUGGESTED READING:

WEBSITE:

1 http://hsi.web.cern.ch/HSI/hippi/spec/introduc.htm

LECTURE 9

FAST ACCESS TECHNOLOGIES

OBJECTIVE:

The objective of this lecture is to have a detailed study of the set of Digital Subscriber Line technologies such as ADSL, HDSL etc. These technologies provide high speed Internet access by transmitting digital data over the wires of a local telephone network. Cable Modem as alternative fast access technology will also be discussed.

CONTENTS:

- DSL Technology
  - Asymmetric digital subscriber line (ADSL)
  - Symmetric digital subscriber line (SDSL)
  - High bit rate digital subscriber line (HDSL)
  - Very high bit rate digital subscriber line (VDSL)
- Cable Modem

- Traditional Cable Networks
- Hybrid fiber-coaxial (HFC) networks
- Sharing
- Devices

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section II Q21
2 Refer Unit 1 Section III Q16,17

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 70-74

REFERENCE BOOK:

1 ibid 3, Page No. 393-400

LECTURE 10

WI FI AND WIMAX

OBJECTIVE:

The objective of this lecture is to provide the students an overview of WiFi and WiMAX which are considered as a wireless communications standard designed to provide higher data rates.

CONTENTS:

- WiMAX
  - IEEE 802.16 Architecture
  - IEEE 802.16 Protocol
  - MAC Layer
  - Physical Layer
- Wi-Fi Protected Access
  - Access Control

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section II Q20
2 Refer Unit 1 Section III Q5,6

SUGGESTED READINGS:

REFERENCE BOOK:

1 ibid 3, Page No. 466-470

WEBSITES:

1 http://www.tutorialspoint.com/wimax/wimax_wifi_comparison.htm
2 http://csrc.nist.gov/archive/wireless/index.html

ARTICLE:

1 Nitsche, T., Cordeiro, C., Flores, A.B., Knightly, E.W. , Perahia, E., Widmer, J.C., "IEEE 802.11ad: Directional 60 GHz Communication for Multi-Gigabit-per-second Wi-Fi", Communications Magazine, IEEE, Volume 52 , Issue 12, Dec 2014, pp 132 – 141.

UNIT - II

LECTURES 11-12

IPV 6

OBJECTIVE:

The objective of these lectures is to make the students understand the concepts of next generation IP, IPv6. It is the latest revision of the Internet Protocol (IP), the communications protocol that routes traffic across the Internet. Addressing in IPv6 will be discussed along with its features such as autoconfiguration and renumbering.

CONTENTS:

- Introduction
  - Address Space
  - Address Types
  - Broadcasting and Multicasting
- Address Space Allocation
  - Assigned and Reserved Blocks
- Global Unicast Addresses
  - Three Levels of Hierarchy
- Auto configuration
- Renumbering

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q14, 15, 16

2 Refer Unit II Section III Q5,6

OTHER ASSIGNMENT:

1 ibid 1, Page No. 784,785, Q 12, 13, 14

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 769-782

REFERENCE BOOK:

1 ibid 3, Page No. 666-673, 1053-1067

LECTURES 13-15

IPv6 PROTOCOL AND PACKET FORMAT

OBJECTIVE:

The objective of these lectures is to make students understand the IPv6 protocols and its packet format including extension and option. It is intended to replace IPv4, which still carries the vast majority of Internet traffic. The differences between the IPv4 and IPv6 will be discussed.

CONTENTS:

- Introduction
- Packet Format
  - Base Header
  - Flow Label
  - Comparison between IPv4 and IPv6 Headers
  - Extension Headers
  - Comparison between IPv4 and IPv6
- Transition from IPv4 to IPv6
  - Dual Stack
  - Tunneling
  - Header Translation

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q3, 9, 17, 18
2 Refer Unit II Section III Q 10, 12, 14

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 799, Q 2
2 ibid 2, Page No. 235, Q 4,5,6,7,8
3 ibid 2, Page No. 252, Q 1,3,4,5

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 787-797

REFERENCE BOOK:

1 ibid 3, Page No. 674-678

LECTURES 16-20

ICMPv6 PROTOCOL

OBJECTIVE:

The objective of these lectures will help student understand the Internet Control Message Protocol. The various types of messages that are returned to the sender using ICMP messages including error messages and neighbor discovery messages will be discussed in detail.

CONTENTS:

- Introduction
- Error Messages
    - Destination-Unreachable Message
    - Packet-Too-Big Message
    - Time-Exceeded Message
    - Parameter-Problem Message
- Informational Messages
    - Echo-Request Message
    - Echo-Reply Message
- Neighbor-Discovery Messages
    - Router-Solicitation Message
    - Router-Advertisement Message
    - Neighbor-Solicitation Message
    - Neighbor-Advertisement Message
    - Redirection Message
    - Inverse-Neighbor-Solicitation Message
    - Inverse-Neighbor-Advertisement Message
- Group Membership Messages

    - Membership-Query Message
    - Membership-Report Message
    - Functionality
- Application programming interface for IPV6.6 bone.

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q19
2 Refer Unit II Section III Q7, 8, 9

OTHER ASSIGNMENT:

1 ibid 1, Page No. 813, Q 1, 3, 4, 7

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 800-810

REFERENCE BOOK:

1 ibid 3, Page No. 679-682

LECTURES 21-22

ATM

OBJECTIVE:

The objective of these lectures is to explain students the basic concepts of ATM and its layers. This lecture acquaints the students with all the different layers of the ATM in detail.

CONTENTS:

- ATM reference model
    - Design Goals
    - Cell Network
    - Architecture
- ATM Layers
    - AAL Layer
    - ATM Layer
    - Physical Layer

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q20
2 Refer Unit II Section III Q13,15,16,17

OTHER ASSIGNMENT:

1 ibid 2, Page No.156, Q 1, 2,3,4,5,6,11

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No.77-86

REFERENCE BOOK:

1 ibid 3, Page No. 421-429

UNIT - III

LECTURES 23-25

MOBILE IP

OBJECTIVE:

The objective of these lectures is to understand the mobility in network, and mobile security issues.

CONTENTS:

- Addressing
  - Stationary Hosts
  - Mobile Hosts
- Agents
  - Home Agent
  - Foreign Agent
- Three Phases
  - Agent Discovery
  - Registration
  - Data Transfer
- Inefficiency in Mobile IP
  - Double Crossing
  - Triangle Routing

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q16, 21
2 Refer Unit III Section III Q14, 15, 18

OTHER ASSIGNMENT:

1 ibid 1, Page No. 279-280, Q 1,2,4,5,6,11

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 268-277

REFERENCE BOOK:

1 ibid 2, Page No. 339-345

ARTICLES:

1 Gomez, K. , Goratti, L. , Rasheed, T., Reynaud, L., "Enabling Disaster-Resilient 4G Mobile Communication Networks", IEEE Communications Magazine, December 2014, Vol. 52, No. 12, pp. 66-73.
2 G Wu, S Talwar, K Johnsson, N Himayat, KD Johnson, "M2M: From mobile to embedded internet", Communications Magazine, IEEE , Volume 49 , Issue 4, April 2011, pp. 36-43.
3 Paul Schmitt, Daniel Iland, Elizabeth Belding, "Smartcell: small-scale mobile congestion awareness", IEEE Communications Magazine, Volume 54, Issue 7,July 2016, pp 44 – 50.

LECTURES 26-28

IP MULTICASTING

OBJECTIVE:

The objective of these lectures is to help students understand multicasting in Internetworking Protocol. The Internet group management protocol and its working will be explained to the students.

CONTENTS:

- Introduction
  - Unicasting
  - Multicasting
  - Broadcasting
- Multicast Addresses

- Multicast Addresses in IPv4
- Selecting Multicast Address
- Delivery of Multicast Packets at Data Link Layer

- IGMP
  - Group Management
  - IGMP Messages
  - IGMP Protocol Applied to Host
  - IGMP Protocol Applied to Router
  - Role of IGMP in Forwarding
  - Variables and Timers
  - Encapsulation
  - Compatibility with Older Versions

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q1,3,12
2 Refer Unit III Section III Q1,3,16

OTHER ASSIGNMENT:

1 ibid 1, Page No. 369-370, Q 2,3,4, 7, 8

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 335-355

REFERENCE BOOK:

1 ibid 3, Page No.640-660

ARTICLE:

1 Ines Houidi , Wajdi Louati, , Walid Ben Ameur , Djamal Zeghlache, "Virtual Network Provisioning Across Multiple Substrate Networks", Computer Networks Elsevier, Volume 55, Issue 4, March 2011, pp. 1011–1023.
2 Giovanna Carofiglio, Massimo Gallo, Luca Muscariello, "Optimal Multipath Congestion Control and Request Forwarding in Information-centric Networks: Protocol Design and Experimentation", Computer Networks, Volume 110, 9 December 2016, Pages 104-117, Elsevier.

LECTURES 29-32

MULTICAST ROUTING

OBJECTIVE:

The lectures will give an insight of the basic features of multicasting routing protocols. In these lectures students will be taught in detail about the various multicasting protocols such as DVMR, CBT etc.

CONTENTS:

- Multicasting Routing
  - Optimal Routing: Shortest Path Trees
- Routing Protocols
  - Multicast Link State Routing: MOSPF
  - Multicast Distance Vector
  - DVMRP
  - CBT
  - PIM
- MBONE

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q17, 18, 19, 20
2 Refer Unit III Section III Q16, 17

OTHER ASSIGNMENT:

1 ibid 1, Page No. 370-371, Q 14,16,21,22

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 355-367

REFERENCE BOOK:

1 ibid 2, Page No.317-319

UNIT IV

LECTURES 33-35

TCP EXTENSIONS AND OPTIONS

OBJECTIVE:

The objective of these lectures is to make student understand the basics of TCP Extension for high speed network and new options introduced in TCP. In these lectures students will be explained various options like window size, time stamp, keep alive timer etc.

CONTENTS:

- TCP
  - Network performance
  - Retransmission timer
  - Persistence timer
  - Keep alive timer
  - Time-wait timer
  - Piggybacking
  - TCP Timers
  - Remote Procedure Call
  - Transaction Oriented Approach
  - Options

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section II Q6,7,8,16,17
2 Refer Unit IV Section III Q13

OTHER ASSIGNMENT:

1 ibid 1, Page No. 498-500, 6, 19,20,21,22

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 478-489

REFERENCE BOOK:

1 ibid 2, Page No. 201-204

LECTURES 36-37

NETWORK SECURITY

OBJECTIVE:

The objective of these lectures is to make student understand how the network security works and various mechanisms used in the Internet to make a website secure will also be discussed in detail.

CONTENTS:

- Network security at various layers
- HTTP
- Secure-HTTP
- SSP
- ESP
- Authentication header

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section II Q8, 11,12,15,18
2 Refer Unit IV Section III Q7,8

OTHER ASSIGNMENT:

1 ibid 1, Page No. 888, Q 1, 6

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 664-675, 859-864, 869-886

REFERENCE BOOKS:

1 ibid 2, Page No. 453, 464
2 ibid 4, Page No.272,284

LECTURES 38-42

CRYPTOGRAPHY

OBJECTIVE:

The objective of these lectures is to understand various Network Security mechanisms. Various authentication protocols, key distribution protocols and digital signatures will be discussed in detail.

CONTENTS:

- Key distribution protocols
- Digital signatures
- Digital certificates

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section II Q9,11,12,13,14, 15, 19,20
2 Refer Unit IV Section III Q9,10, 14

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 817-851

REFERENCE BOOKS:

1 ibid 3, Page No. 1077-1108
2 ibid 4, Page No. 100, 153-165

ARTICLE:

1 Yekini N. Asafe, Aigbokhan E. Edwin, Okiki F. Mercy, "Cryptography System for Online Communication Using Polyalphabetic Substitution Method", International Journal of Advanced Networking and Applications", Volume 6, Issue 1, Jul-Aug 2014, pp. 2151-2157.

LECTURE PLAN

OBJECT ORIENTED ANALYSIS AND DESIGN

MCA-208

COURSE OUTLINE
MCA – IV SEMESTER
OBJECT ORIENTED ANALYSIS AND DESIGN - MCA 208

L - 4 Credits – 04

OBJECTIVE:

The objective of this course is to familiarize students with fundamentals of an object oriented software engineering, developing a competency to recognize its design features and issues associated to each type. Also, the focus is on developing a mature understanding of software design and its performance during development of a project.

INTERNAL ASSESSMENT AND ASSIGNMENT **(25 marks)**
1. Class Test-I – (Written Test) (15 marks)
2. Class Assessment + Attendance (10 marks)

COURSE CONTENTS:

UNIT-I REVIEW OF OBJECT MODELING (12 Hours)

- Importance of Object modeling
- Object Oriented Lifecycle Model
- Introduction to Object Oriented Methodology
- Object oriented methodologies

UNIT-II INTRODUCTION TO OOSE –ARCHITECTURE &ANALYSIS (9 Hours)

- Layers of OOSE
- Models of OOSE
- Requirements model
- Analysis model

UNIT-III INTRODUCTION TO OOSE –CONSTRUCTION AND TESTING (9 Hours)

- Design model
- Test model
- Testing process
- Implementation model

UNIT-IV WORKING WITH UML (12 Hours)

- Origin of UML
- 4+1 view architecture of UML
- Building blocks of UML
- Conceptual model of UML
- UML diagrams

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of Object Oriented Analysis and Design. Students are advised to go through the material for thorough understanding of the subject.

- **TEXT BOOKS**

1. **Author's Name(s):** Ivar Jacobson
   Title: Object Oriented Software Engineering
   Edition: I Year**:** 2012
   Publisher: Pearson (ibid 1)

2. **Author's Name(s):** Grady Booch, James Rumbaugh & Ivar Jacobson
   Title: The Unified Modeling Language User Guide
   Edition: I **Year:** 2011
   Publisher: Addison Wesley (ibid 2)

- **REFERENCE BOOKS**

1. **Author's Name(s):** Ivar Jacobson, Grady Booch & James Rumbaugh
   Title: The Unified Software Development Process
   Edition: II **Year:** 2013
   Publisher: Pearson (ibid 3)

2. **Author's Name(s):** H. Srimathi, H. Sriram & A. Krishnamoorthy
   Title: Object Oriented Analysis and Design
   Edition: II **Year:** 2013
   Publisher: SciTech (ibid 4)

3. **Author's Name(s):** Mahesh. P. Matha
   Title: Object Oriented Analysis and Design using UML
   Edition: II **Year:** 2014
   Publisher: PHI Learning (ibid 5)

- **PERIODICALS**

1. I-Manager's Journal on Software Engineering, Vol. 6, No. 3, March 2012.
2. I-manager's Journal on Software Engineering, Vol. 6, No. 4,April-June 2012.
3. International Journal of Computing & Applications, Vol. 7, No. 1, Jan-June 2012.
4. ACM SIGSOFT Software Engineering Notes, Vol. 38, No. 5, September 2013.
5. International Journal of Computing &Applications, Vol. 9, No. 1, Jan-June 2014.
6. Journal of Software Engineering and Technology, Vol. 6.No. 2, July- December 2014.
7. International Journal of Computer Applications, Vol 5, No. 2, August –December 2015.

8 International Journal of Scientific & Engineering Research, Volume 5, Issue 9, November 2015.

LECTURES 1-2

REVIEW OF OBJECT MODELING

OBJECTIVE:

The objective of these lectures is to give a basic review about object modeling. The object modelling encompasses the principles of abstraction, encapsulation, persistence and modularity.

CONTENTS:

- Importance of Object modeling
  - Why do we Model?
  - Principles of modeling
  - Object oriented modeling

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section 2 Q3-4,5,7
2 Refer Unit I Section 3 Q1, 2 , 3

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 2, Page No. 3-11,12-13
2 ibid 3, Page No. 6-9

REFERENCE BOOKS:

1 ibid 3, Page No. 22-24,25-29
2 ibid 5, Page No. 1-2,4-9
3 ibid 4, Page No. 12-17

LECTURES 3-5

OBJECT ORIENTED THINKING-RETHINKING

OBJECTIVE:

The objective of the lectures is to understand the software engineering process from object oriented perspective.

CONTENTS:

- Objects
- Classes
- Links & associations
- Generalization & specialization
- Inheritance & grouping concepts
- Aggregation
- Composition
- Abstract classes
- Polymorphism
- Meta data
- Constraints
- Reuse

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section 2 Q5, 6, 17-19,14, 21
2 Refer Unit I Section 3 Q4,7, 9,10, 6
3 Refer Unit I Section 4 Q1

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 66-92,93-101
2 ibid 2, Page No. 108-129

REFERENCE BOOKS:

1 ibid 5, Page No. 2-6,7-15
2 ibid 3, Page No. 14-18,19

WEBSITES:

1 http://www.codeproject.com/KB/architecture/OOP_Concepts_and_manymore.aspx
2 http://home.iitk.ac.in/~blohani/Limulator/publication/Rakesh_Indore_SE.pdf
3 http://www.ijcaonline.org/research/volume123/number1/amalarethinam-2015-ijca-905226.pdf
4 Object Management Group. UML 2.0OCLSpecification.http://www.omg.org/docs/ptc/03-10-14.pdf
5 http://www.sciencedirect.com/science/article/pii/S1877050915035644
6 http://c2.com/cgi/wiki?HighLevelLanguage
7 http://www.teachict.com/gcse_computing/ocr/216_programming/programming_languages/miniweb/pg4.htm

LECTURES 6-8

OBJECT ORIENTED LIFE CYCLE MODEL

OBJECTIVE:

The objective of these lectures is to provide a comparative study of system development life cycle with object oriented system development life cycle (OOSDLC). The purpose of the lecture is to examine how the object-oriented approach is related to the conceptions of the life-cycle of software and what factors will motivate the adoption of an object-oriented approach to software development.

CONTENTS:

- Introduction
- OOSDLC
    - Object oriented Analysis
        - Project scope
        - Context diagram
        - Use- case model
        - Reengineering
    - Interface Engineering
    - Object oriented design
    - Object oriented construction
    - Object oriented testing
    - Object oriented maintenance

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section 2 Q7-10, 22-23, 24-27
2 Refer Unit I Section 3 Q7, 8,11-15, 29-30, 32, 23
3 Refer Unit I Section 4 Q 1-2 , 3-9

OTHER ASSIGNMENTS:

1 ibid 4, Page No. 104, Q 1-5
2 ibid 5, Page No. 93 , Q-2-6

SUGGESTED READINGS:

REFERENCE BOOK:

1 ibid 4, Page No. 95-104

WEBSITES:

1 http://micajeudy.hubpages.com/hub/Object-Oriented-Systems-Development-Life-Cycle
2 http://mytechnicalarticles.files.wordpress.com/2011/03/object-oriented-systems-development-life-cycle_ppt.pdf
3 http://www.cc.gatech.edu/home/orso/papers/orso.silva.AQUIS98.pdf
4 http://www.greenbookee.org/object-oriented-software-engineering-ivar-jacobson/
5 https://ifs.host.cs.st-andrews.ac.uk/Research/Publications/Papers-PDF/2005-09/TKDE-Ponpit-2009.pdf
6 http://www.teachict.com/gcse_computing/ocr/216_programming/programming_languages/miniweb/pg4.htm
7 https://www.macs.hw.ac.uk/~pjbk/pathways/cpp1/node22.html

LECTURES 9-12

OBJECT ORIENTED METHODOLOGIES

OBJECTIVE:

The objective of the lectures is to give an overview of object oriented development methods that aim at modeling systems in terms of objects which form the basis of system realization.

CONTENTS:

- A summary of object-oriented methods
- Object-oriented analysis (OOA/ Coad-Yourdon)
    - Architecture
    - Method
    - Deliverables
    - Discussion
- Object-oriented Design (OOD/ Booch)
    - Architecture
    - Method
    - Deliverables
    - Discussion
- Hierarchical Object-oriented Design (HOOD)
    - Architecture
    - Method
    - Deliverables
    - Discussion
- Object modeling technique (OMT)
    - Architecture
    - Method
    - Deliverables
    - Discussion

- Responsibility driven design
    - Architecture
    - Method
    - Deliverables
    - Discussion

ASSIGNMENTS FROM QUESTION BANK:

- Refer Unit I Section 2 Q10, 15, 16, 23-24
- Refer Unit I Section 3 Q8, 14, 20-21, 23-28
- Refer Unit I Section 4 Q 4,5,6,7,8

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 498-526
2 ibid 1, Page No. 536-546

REFERENCE BOOKS:

1 ibid 5, Page No. 6- 8
2 ibid 2, Page No. 130-136

ARTICLES:

1 Dharmendra Lal Gupta , Anil Kumar Malviya, "A Comparative Study of Software Quality Prediction Techniques for Object Oriented System", I-manager's Journal on Software Engineering, Vol. 6, No. 4, April-June 2012, pp 1-8
2 S. Pasupathy , Dr. R. Bhavani , "An Efficient Methodology for Developing and Maintaining Consistent Software Using OOAD Tools ", International Journal of Innovative Research in Science , Engineering and Technology , Vol. 4, Issue 2 , Feb , 2015
3 I.S.P. Angelin Claret, "Object Oriented and Component Based Methods in Power Distribution System", Advanced Engineering and Applied Sciences: An Internal Journal, ISSN 2320-3927, Vol . 4 , Issue 3 , Sept 2015.
4 Ashwini Mujumdar , Gayatri Masiwal , P/M Chawan ," Analysis of Various Software Process Model ", International Journal of Engineering Research and Applications (IJERA) , ISSN :2248-9622,Vo. 2 Issue 3 , May – June 2012 , pp.2015 2021, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.416.770&rep=rep1&type=pdf
5 Matthew B. Dwyer and David S. Rosenblum ,"Editorial Journal – First Publication for the Software Engineering Community ", IEEE Transaction on Software Engineering , Vol.42, No. 1, January 2016 , https://www.computer.org/csdl/trans/ts/2016/01/07374796.pdf.
6 "Algorithmic Nuggets in Content Delivery ", Bruce M. Maggs , Ramesh K. Sitaraman , ACM SIGCOMM Computer Communication Review , Volume 45, Number 3, July 2015. Page No. 52-66.

LECTURES 13-18

OBJECT ORIENTED SOFTWARE ENGINEERING

OBJECTIVE:

The objective of these lectures is to study the OOSE methodology and OO paradigm in detail. The purpose the lecture is to mention the software design technique that is used in software design in object-oriented programming.

CONTENTS:

- Object Oriented Software Engineering
  - Meaning and features of OOSE
  - Object Oriented Lifecycle model
    - Introduction
    - Phases
    - Advantages
    - Disadvantages
    - Suitability of projects
  - Layers of OOSE
    - Architecture
    - Process
      - Analysis process
      - Construction process
      - Component process
      - Testing process
    - Method
    - Tools
- A Comparative study of Software Engineering and Object Oriented Software Engineering

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section 2 Q1, 3, 4, 6, 9, 14-17, 22-24
2 Refer Unit II Section 3 Q1, 2, 6,9
3 Refer Unit II Section 4 Q 1-8,26,28,29
4 Refer Unit I Section 3 Q30, 31, 33, 34

OTHER ASSIGNMENT:

1 ibid 4, Page No. 229, Q1-7,8,9

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 93-104,131-150

REFERENCE BOOKS:

1 ibid 4, Page No. 201-203.
2 Ibid 3, Page No. 167, 178, 185

ARTICLES:

1 Anil Kumar Malviya, Vinod Kumar Yadav, "Predicting Object Oriented Software Systems Maintainability at Design Level using K-means Clustering Technique", I-manager's Journal on Software Engineering, Vol. 6, No. 4, April-June 2012, pp 33-36.
2 Matthias Galster, Mehdi Mirakhorli, Jane Cleland-Huang, " Views on Software Engineering from the Twin Peaks of Requirements and Architecture", ACM SIGSOFT Software Engineering Notes, Vol. 38, No. 5, September 2013, pp 40-42
3 Bakshish Singh Gill, Manjit Singh Gill," Cost of Reengineering(Object Oriented Software Systems)versus Developing new one-A Comparison", Journal of Software Engineering and Technology, Vol. 6, No. 2, July- December 2014, pp 109-113
4 Ritika Sharma, Neha Budhija, Bhupinder Singh, "Study of Predicting Fault Prone Software Modules", International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 2, Issue 2, Feb 2014.
5 George A. Sielis," ArchReco: a software tool to assist software design based on context aware recommendations of design patterns" Journal of Software Engineering Research andDevelopment, Volume 6 , Number 3 , April 2017 , DOI: 10.1186/s40411-017-0036-y, https://jserd.springeropen.com/articles/10.1186/s40411-017-0036-y

LECTURES 19-30

SYSTEM DEVELOPMENT AS MODEL BUILDING

OBJECTIVE:

The objective of the lectures is to study the various models of architecture layer which forms the basis of system development.

CONTENTS:

- System Development is model building
  - Requirements model
    - Meaning
    - A problem domain model
      - Object name
      - Logical attributes
      - Static instance associations
      - Inheritance
      - Dynamic instance associations
      - Operations
    - Interface descriptions

- A use case model
  - Meaning of use case
  - Actors and its types
  - Relationships
- Analysis model
  - Meaning
  - Objects
    - Entity
    - Interface
    - Control
  - Dimensions
    - Information
    - Behavior
    - Presentation
  - Working with analysis objects
- Construction Process
  - Need of construction process
  - Major steps in construction process
  - Design model
    - Traceability
    - Objects
      - Block
    - Dimensions
      - Information
      - Behavior
      - Presentation
      - Implementation Environment
    - Interaction diagrams
  - Block design

    Block interface

    Object behavior

    State chart diagrams

    Internal block structure
- Implementation model

  Component

  Implementation Subsystem

  Interface
- Testing Process
  - Test model

    Test case

    Test procedure

    Test component
  - Unit testing
    - Equivalence testing
    - Boundary testing

        - Path testing
        - State based testing
    - Integration testing
        - Big Bang testing
        - Top down testing
        - Bottom up testing
        - Sandwich testing
    - System testing
        - Functional testing
        - Performance testing
        - Pilot testing
        - Acceptance testing
        - Installation testing
- Case studies
    - Recycling Machine
    - Warehouse Management system
    - Telecom

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section 2 Q2,5,7,8,10
2 Refer Unit II Section 3 Q3-5,7-14, 21-23
3 Refer Unit II Section 4 Q1-5, 9
4 Refer Unit III Section 2 Q1-11, 16-22, 24
5 Refer Unit III Section 3 Q1-13, 21-23
6 Refer Unit III Section 4 Q1-5, 6

OTHER ASSIGNMENT:

1 ibid 4, Page No. 11.38, Q2,5-14

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 150-174,177-223, 225-280, 337-362, 367-416, 417-459
2 ibid 2, Page No. 178, 198, 211, 236, 267, 268-274

REFERENCE BOOKS:

1 ibid 4, Page No. 11.1-11.33
2 ibid 5, Page No. 42-71,72-79
3 ibid 3, Page No. 54-67

ARTICLES:

1 Vibhash Yadav, Raghuraj Singh, Prashant Kumar Mishra, "Object-Oriented Metrics: Features & Defects in Software Design & Quality", International Journal of Computing & Applications, Vol. 7, No. 1, Jan-June 2012, pp 27-29.

2 Shikha Maheshwari , Dinesh Ch. Jain, " A Comparative Analysis of Different Types of Models in Software Development Life Cycle ", International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 2, Issue 5, May 2015, http://www.ijarcsse.com/docs/papers/May2012/Volum2_issue5/V2I500405.pdf

3 "Cooperative Group Provisioning with Latency Guarantees in Multi- Cloud Deployments", Sean Yaw, Eben Howard, Brendan Mumey, Mike P.Wittie, ACM SIGCOMM Computer Communication Review , Volume 45, Number 3, July 2015. Page No. 5 – 11.

WEBSITE:

1 http://www.ambysoft.com/essays/floot.html

2 http://research.ijcaonline.org/volume63/number13/pxc3885514.pdf

3 http://www.aptest.com/resources.html

4 http://www.istqb.org/certification-path-root/foundation-level/foundation-level-material-for-download.html

5 http://compnetworking.about.com/od/networkdesign/a/topologies.htm

6 http://study.com/academy/lesson/types-of-networks-lan-wan-wlan-man-san-pan-epn-vpn.html

LECTURES 31-42

UNIFIED MODELLING LANGUAGE

OBJECTIVE:

The objective of these lectures is to learn why UML is relevant to the process of developing software-intensive systems.

CONTENTS:

- UML
  - Meaning and overview of UML
  - History of UML
  - Conceptual model of UML
    - Building blocks of UML
      - Things
        - Structural
        - Behavioral
        - Grouping
        - Annotational
      - Relationships

        - ❖ Dependency
        - ❖ Association
        - ❖ Generalization
        - ❖ Realization
    - Diagrams
        - ❖ Use Case diagram
        - ❖ Class diagram
        - ❖ Object diagram
        - ❖ Sequence diagram
        - ❖ State chart diagram
        - ❖ Collaboration diagram
        - ❖ Activity diagram
        - ❖ Component diagram
        - ❖ Deployment diagram
- Rules of UML
    - Names
    - Scope
    - Visibility
    - Integrity
    - Execution
- Common mechanisms in UML
    - Specifications
    - Adornments
    - Common divisions
    - Extensibility
        - ❖ Stereotypes
        - ❖ Tagged values
        - ❖ Constraints

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section 2 Q1-14, 15-18, 22, 23, 25-29, 30-33
2 Refer Unit IV Section 3 Q1-10, 11-19 , 21-25,26-29
3 Refer Unit IV Section 4 Q1-13, 14,15,17
4 Refer Unit III Section 3 Q 24, 25
5 Refer Unit III Section 4 Q 8,9

OTHER ASSIGNMENT:

1 ibid 4, Page No. 5.41-5.42, Q1-26

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 13-34, 49-73,75-88, 91-103,105-115, 233-241, 243-255, 257-272, 287-306, 343-348.

REFERENCE BOOKS:

1 ibid 4, Page No. 5.1-5.39.
2 ibid 5, Page No.74-78
3 ibid 5, Page No. 108-113
4 ibid 1, Page No. 423-456

ARTICLES:

1 A.V.K Shanthi ,G. Mohan Kumar, "A Heuristic Technique for Automated Test Cases Genmeration from UML Activity Diagram", I-manager's Journal on Software Engineering, Vol. 6, No. 3, March 2012, pp 13-20.
2 Rumpa Hazra, Shouvik Dey, Ananya Kanjilal, Swapan Bhattacharya, "Comparative Analysis of Real Time Resource Access Control Protocols using UML 2.0", ACM SIGSOFT Software Engineering Notes, Vol. 38, No. 5, September 2013, pp 64-64, http:// doi.acm.org/10.1145/2507288.2507305
3 Liguo Yu and Alok Mishra, "Experience in Predicting Fault-Prone Software Modules using Complexity Metrics", Quality Technology , & Quantitative Management, Vol. 9, No.4, pp. 421-433, 2012.
4 "Research Challenges in Future Multi- domain Network Performance Measurement and Monitoring ",Prasad Calyam , Martin Swany, ACM SIGCOMM Computer Communication Review , Volume 45, Number 3, July 2015. Page No. 29 – 34.

WEBSITES:

1 http://www.uml.org/
2 http://www.omg.org/news/meetings/workshops/presentations/eai_2001/ tutorial_Monday /tockey_tutorial/1-Intro.pdf
3 http://www.omg.org/docs/omg/00-11-01.ppt#401,4,Tutorial Goals
4 www.objectmentor.com/resources/articles
5 http://research.ijcaonline.org/volume63/number13/pxc3885514.pdf
6 http://c2.com/cgi/wiki?HighLevelLanguage

LECTURE PLAN

WEB TECHNOLOGIES

MCA-210

COURSE OUTLINE
MCA-IV SEMESTER
WEB TECHNOLOGIES – MCA 210

L - 4 Credits – 04

OBJECTIVE:

Web-based applications and services have changed the landscape of information delivery and exchange in today's corporate, government, and educational arenas. The purpose of this course is to enable the students to learn the basics of web technologies and gain an insight of its exciting features so that they can develop various applications.

INTERNAL ASSESSMENT AND ASSIGNMENT **(40 MARKS)**

1. Class Test-I – (Written Test) (15 marks)
2. Class Test-II - (Written Test) (15 marks)
3. Class Assessment + Attendance (10 marks)

COURSE CONTENTS:

SECTION A **(10 hours)**

- Overview of Internet and web
- HTML tags
- Forms
- Frames
- Introduction to JavaScript
- Cascading Style Sheets
- DHTML
- Using web design tools- Dreamweaver

SECTION B **(10 hours)**

- Building ASP.Net Page
- Building Forms with Web Server Controls
- Performing Form Validation with Validation Control
- Advanced Control Programming
- Introduction to ADO.Net
- Binding Data to web Control
- Using the DataList and DataGrid Controls
- Working with DataSets
- Working with XML

SECTION C **(10 hours)**

- Creating ASP.Net Application
- Tracking User Sessions
- Caching ASP.Net Application
- Application Tracking and Error Handling
- Securing ASP.Net
- Using Form-Based Authentication
- Using Windows-Based Authentication,
- Encrypting Data over the Network

SECTION D **(12 hours)**

- Introduction to Service-Oriented Architectures
- XML basics
- SOAP
- SOAP message structure
- WSDL
- UDDI
- Overview of Grid and Cloud Computing.
- Latest trends in Web technologies
- A Case Study for developing interactive web applications

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of Web Technologies and students are advised to go through the material for thorough understanding of the subject.

➢ **MAIN TEXT BOOK:**

1. **Author's Name(s):** Stephen Walther
   Title: ASP.NET 4 Unleashed
   Edition: I **Year:** 2011
   Publisher: Pearson (ibid 1)

➢ **REFERENCE BOOKS:**

1. **Author's Name(s):** Matthew MacDonald
   Title: ASP.NET 4.5 in C#
   Edition: I **Year:** 2013(Reprint)
   Publisher: Apress (ibid 2)

2. **Author's Name(s):** Kogent Learning Solutions Inc.
   Title: HTML 5-Black Book
   Edition: I **Year:** 2012(Reprint)
   Publisher: Dreamtech Press (ibid 3)

3. **Author's Name(s):** Ivan Bay Ross
   Title: Web enabled commercial application development using HTML, DHTML, JavaScript, and Perl CGI
   Edition: IV **Year:** 2012(Reprint)
   Publisher: BPB Publications (ibid 4)

4. **Author's Name(s):** Ivan Bay Ross
   Title: HTML 5 and CSS 3
   Edition: I **Year:** 2012(Reprint)
   Publisher: BPB Publications (ibid 5)

5. **Author's Name(s):** Kogent Learning Solutions Inc.
   Title: ASP.NET 4.5
   Edition: I **Year:** 2013
   Publisher: Dreamtech Press (ibid 6)

6. **Author's Name(s):** Terry McNavage
   Title: JavaScript for Absolute Beginners
   Edition: I **Year:** 2014
   Publisher: Apress (ibid 7)

➢ PERIODICALS

1 Conference on Electronics, Telecommunications and Computer Science ETAI 2011, http://arxiv.org/ftp/arxiv/papers/1201/1201.0357.pdf

2 International Journal of Computational Engineering Research, Vol. 2, Issue 5, September 2012 ,www.ijceronline.com/papers/Vol2_issue5/AR02514301437.pdf

3 Proceedings of the Symposium on Principles of Programming Languages, January 23–25, 2013, http://research.microsoft.com/enus/um/people/livshits/papers/pdf/pop l13b.pdf

4 The IUP Journal of Computer Sciences, Vol. 7, No. 1, January 2013

5 International Journal of Scientific and Research Publications, Volume 3, Issue 5, May 2013

6 The IUP Journal of Computer Sciences, Vol. 7, No. 4, October 2013

7 International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 3, March 2014, http://www.ijarcsse.com/docs/papers/Volume_4/3_March2014/V4I3-0759.pdf

8 International Journal of Computer Science & Knowledge Engineering,Volume 8, Number 1, Jan-June 2014

9 International Journal on Web Service Computing (IJWSC), Vol. 5, No.2, June 2014, http://airccse.org/journal/jwsc/papers/5214ijwsc01.pdf

10 International Journal of Scientific & Technology Research Volume 3, Issue 7, July 2014, http://www.ijstr.org/final-print/july2014/Critical-Comparison-Of-Php-And-Aspnet-For-Web-Development.pdf

11 PC Quest, November 2014

12 International Journal of Advanced Networking and Applications, Volume 6, Issue 2, Sept-October 2014.

13 Journal of Internet Services and Applications 2017

14 IEEE Internet of Things Journal, 2017

15 IEEE Transactions on Cloud Computing,2017

16 PeerJ Computer Science, 2017

LECTURE 1

OVERVIEW OF INTERNET

OBJECTIVE:

The objective of the lecture is to learn basics of web site designing and to make students aware of various Internet and Intranet services available.

CONTENTS:

- ➢ Introduction to Internet
- ➢ Internet Services
  - o Email
  - o Telnet
  - o FTP
  - o Usenet News
  - o IRC(Internet Relay Chat)
  - o RSS
- ➢ Features provided by Internet
  - o Communications
  - o Information search
  - o File manipulation
  - o Remote control of other computers
  - o Cruise the Net through hypermedia
  - o Electronic Commerce

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q17-18,32,38,39
2 Unit I, Section III Q3

SUGGESTED READINGS:

REFERENCE BOOK:

1 ibid 3, Page No. 2-7

WEBSITES:

1 http://whitefiles.org/b1_s/1_free_guides/fg2cd/pgs/m01.htm
2 home.ubalt.edu/abento/701/netoverview/netoverview.pp

ARTICLE:

1 Edson Floriano,Eduardo Alchieri, Diego F. Aranha and Priscila Solis, ”Providing privacy on the tuple space model”, *Journal of Internet Services and Applications* 2017, Springers online publications, https://doi.org/10.1186/s13174-017-0070-3

2 Jie Lin ; Wei Yu ; Nan Zhang ; Xinyu Yang ; Hanlin Zhang ; Wei Zhao,"A Survey on Internet of Things: Architecture, Enabling Technologies, Security and Privacy, and Applications", IEEE Internet of Things Journal , Volume: 4, Issue: 5, Oct.2017,Page(s): 1125 - 1142, 15 March 2017, ISSN: 2327-4662, DOI: 10.1109/JIOT.2017.2683200

LECTURES 2-5

HTML

OBJECTIVE:

The objective of these lectures is to gain an insight of HTML and the various tags available in HTML for different purposes.

CONTENTS:

- Introduction to HTML
- Introduction to HTTP
- Sections in HTML page
  - Head
  - Title
  - Body
- HTML tags
  - P
  - Pre
  - Br
  - Em
  - Strong
  - Marquee
  - H1 to H6
  - Image
  - Style
- Creating Hyperlinks
- Setting Fonts in HTML pages
- Aligning Text
- Creating Lists
  - Unordered list
  - Ordered list
- Creating Tables
  - Table tag
  - thead tag
  - td tag
  - tr tag
  - Column span
  - Row span

- ➢ Creating Frames in HTML
    - o Frameset tag
    - o Frame tag
    - o Noframes tag
- ➢ Creating Forms in HTML
    - o Form tag
    - o Input tag
    - o Textarea tag
    - o Label
    - o Fieldset
    - o Select
    - o Option
    - o Button
- ➢ Adding graphics to a HTML page

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q3, 5, 31, 34, 35
2 Unit I, Section III Q11, 14, 15, 23, 24

SUGGESTED READING:

REFERENCE BOOKS:

1 ibid 3, Page No. 31-76, 77-111, 145-166, 189-231
2 ibid 4, Page No. 33-53, 65-66, 80-90, 99-116, 125-136, 163-180

LECTURES 6-7

OVERVIEW OF HTML5

OBJECTIVE:

Web developers are switching to the HTML5 platform, as it opening new doors to web designers by providing new elements. In these lectures, the students will learn about the new features of HTML5 and how it is the next generation of web development.

CONTENTS:

- ➢ What is HTML 5?
- ➢ New features of HTML5
    - o Offline web application support
    - o Threaded JavaScript
    - o Standardized communication between browsers and web servers
    - o Richer forms support
    - o New structural and semantic markup

- ➢ Comparison of HTML 4 and HTML 5

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q26-30
2 Unit I, Section III Q19-20

SUGGESTED READINGS:

REFERENCE BOOKS:

1 ibid 3, Page No. 7-29
2 ibid 5, Page No. 2-16, 43-56

WEBSITES:

1 http://www.tutorialspoint.com/html5/html5_overview.htm
2 http://www.html-5-tutorial.com/
3 http://www.htmlgoodies.com/html5/tutorials/Web-Developer-Basics-Differences-Between-HTML4-And-HTML5-3921271.htm#fbid=Jktb-aKDSk0

ARTICLE:

1 T.N. Sharma, Priyanka Bhardwaj, Manish Bhardwaj, "Differences between HTML and HTML 5", International Journal of Computational Engineering Research, Vol. 2, Issue 5, September 2012, www.ijceronline.com/papers/Vol2_issue5/AR02514301437.pdf
2 Peroni S, Osborne F, Di Iorio A, Nuzzolese AG, Poggi F, Vitali F, Motta E. (2017) Research Articles in Simplified HTML: a Web-first format for HTML-based scholarly articles. *PeerJ Computer Science* 3: e132 https://doi.org/10.7717/peerj-cs.132

LECTURE 8

DOCUMENT OBJECT MODEL

OBJECTIVE:

The Document Object Model (DOM) is a cross-platform and language-independent convention for representing and interacting with objects in HTML, XHTML and XML documents. The objective of the lecture is to explain the DOM hierarchy in detail.

CONTENTS:

- ➢ Meaning of DOM
- ➢ Hierarchical structure of DOM
    - o Window object
    - o Document object
    - o Form object

- Form control elements

➢ Graphical representation of DOM for HTML code

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q 25
2 Unit I, Section III 18

SUGGESTED READINGS:

REFERENCE BOOK:

1 ibid 3, Page No. 406-418

WEBSITES:

1 http://www.brainjar.com/dhtml/intro/
2 http://oreilly.com/catalog/jscript4/chapter/ch17.html

LECTURES 9-11

DHTML

OBJECTIVE:

In these lectures, the focus will be on how to create dynamic web pages using CSS.

CONTENTS:

➢ Difference between Static and Dynamic Web Pages
➢ Introduction to DHTML
➢ Advantages of DHTML over HTML
➢ Cascading style sheets
  - Inline style sheets
  - Internal style sheets
  - External style sheets
  - Creating classes in style sheets
➢ Using style sheets in web pages
➢ Web site development using basic HTML tags and CSS
➢ Scripting Languages
  - Server-side Scripting
  - Client-side Scripting

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q 11, 13, 14, 15, 19, 22, 40
2 Unit I, Section III Q6, 7, 13, 17

SUGGESTED READING:

REFERENCE BOOKS:

1 ibid 3, Page No. 465-485, 487-518, 521-543, 623-633
2 ibid 4, Page No. 497-524

LECTURES 12-15

VALIDATIONS USING JAVASCRIPT

OBJECTIVE:

Java script is the most popular scripting language on the Internet and works in all the major browsers. The objective of the lectures is to learn Java script and design web pages henceforth.

CONTENTS:

- ➢ Validation in web pages
  - ● Introduction to validations in web pages
  - ● Types of validation
    - o Client side validation
    - o Server side validation
  - ● Difference between client-side and server-side validation
- ➢ Use of scripting in web pages
- ➢ JavaScript
  - ● What is JavaScript
  - ● JavaScript in web pages
- ➢ Advantages of JavaScript
- ➢ Writing JavaScript into HTML
- ➢ Basic programming techniques
  - ● Data types
  - ● Creating variables
  - ● Incorporating variables in script
  - ● Functions in script
  - ● Dialog boxes
  - ● Placing text in browser
- ➢ Validation using JavaScript
- ➢ Form Validation
  - ● Checking for Non-Empty
  - ● Checking for All Number
  - ● Checking for All Letter
  - ● Checking for Numbers and Letters

- Restricting the Length
- Selection Made
- Email Validation

➢ Validating a Form - All at Once
➢ Validating Before Form Submission
➢ Validating On A By Entry Basis
➢ Validating On A Keystroke Basis
➢ Multiple Field Validation
➢ Validating a Registration Form using client – side scripting

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q1, 2, 4, 6, 7, 9, 10, 16, 33
2 Unit I, Section III Q1, 2, 4, 5, 8, 9, 10, 16, 21, 22, 25

SUGGESTED READINGS:

REFERENCE BOOKS:

1 ibid 3, Page No. 265-303,305-332,335-361
2 ibid 4, Page No. 293-332
3 ibid 7, Page No. 1-23, 25-56, 60-94, 98-140

ARTICLES:

1 C´edric Fournet, Nikhil Swamy, Juan Chen, Pierre-Evariste Dagand, Pierre-Yves Strub, Benjamin Livshits, "Fully Abstract Compilation to JavaScript", Proceedings of the Symposium on Principles of Programming Languages, January 23–25, 2013, http://research.microsoft.com/en-us/um/people/livshits/papers/pdf/popl13b.pdf, pp. 371-384.
2 Frolin S. Ocariza, Kartik Bajaj, Karthik Pattabiraman, Ali Mesbah, **"**A Study of Causes and Consequences of Client-Side JavaScript Bugs"**,** IEEE Transactions on Software Engineering, Volume: 43 Issue: 2, 2017, http://ieeexplore.ieee.org/search/serachresult.jsp?searchWithin=%

LECTURES 16-20

OVERVIEW OF THE ASP.NET FRAMEWORK

OBJECTIVE:

ASP.NET is a development framework for building web pages and web sites with HTML, CSS, JavaScript and server scripting. The lectures provide an overview of the basic concepts of ASP.NET.

CONTENTS:

- ASP.NET and the .NET Framework
  - Understanding the Framework Class Library
    - Understanding Namespaces
    - Understanding Assemblies
  - Understanding the Common Language Runtime
  - Approaches for building websites
    - Web pages
    - Web forms
    - MVC(Model View Controller)
- ASP.NET projects
    - Web site projects
    - Web application projects
- Seven pillars of ASP.NET
    - ASP.NET is integrated with the .NET Framework
    - ASP.NET is compiled, not interpreted
    - ASP.NET is Multilanguage
    - ASP.NET is hosted by the Common Language Runtime
    - ASP.NET is Object Oriented
    - ASP.NET supports all browsers
    - ASP.NET is easy to deploy and configure
  - Understanding ASP.NET controls
    - Overview of ASP.NET controls
      - Standard controls
      - Validation controls
      - Rich controls
      - Data controls
      - Navigation controls
    - Understanding HTML controls
    - Understanding and handling control events
  - ASP.NET Page class
  - Understanding Post Back
  - Understanding View State
  - ASP.NET Page lifecycle
    - Page framework initialization
    - User code initialization
    - Validation
    - Event handling
    - Automatic data binding
    - Cleanup

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q1-4,6,18-20,23-25,42,43
2 Unit II, Section III Q1-4,11,14

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 5-52

REFERENCE BOOKS:

1 ibid 2, Page No. 3-13, 79-116,121-129
2 ibid 6, Page No. 56-73,77-101,105-127

ARTICLES:

1 ShikhaVerma, "A Study on Page Life-Cycle of ASP.Net", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 3, March 2014, pp 1216- 1218, http://www.ijarcsse.com/docs/papers/Volume_4/3_March2014/V4I3-0759.pdf
2 Atul Mishra, "Critical Comparison of PHP And ASP.NET for Web Development",International Journal of Scientific & Technology Research Volume 3, Issue 7, July 2014, pp 331-333, http://www.ijstr.org/final-print/july2014/Critical-Comparison-Of-Php-And-Aspnet-For-Web-Development.pdf
3 Aiesha Hasan, ASP.NET Key Trends For 2017,http://www.arpatech.com/blog/key-trends-of-asp-net-2017/

LECTURES 21-25

BUILDING FORMS WITH WEB SERVER CONTROLS

OBJECTIVE:

Web Server controls are specifically designed to work with Web Forms pages**.** The objective of the lectures is to learn form building with the help of web server controls.

CONTENTS:

- ➢ Meaning of Web Server controls
- ➢ Difference between HTML server controls and web server controls
- ➢ HTML server controls
  - o HtmlInputButton
  - o HtmlInputCheckbox
  - o HtmlInputFile
  - o HtmlInputImage
  - o HtmlInputPassword
  - o HtmlInputRadioButton
  - o HtmlInputHead
  - o HtmlText
  - o HtmlLink
  - o HtmlButton
  - o HtmlForm

- HTmlTable

➢ Web server controls
- Basic web controls
  - Button
  - Checkbox
  - Hyperlink
  - Image
  - Imagebutton
  - Label
  - Linkbutton
  - Literal
  - Panel
  - Placeholder
  - Radiobutton
  - Table
  - Tablecell
  - Tablerow
  - Textbox
  - ImageMap
- Validation controls
  - RequiredFieldValidator
  - RangeValidator
  - CompareValidator
  - RegularExpressionValidator
  - CustomValidator
  - ValidationSummary
- List controls
  - ListBox
  - CheckBoxList
  - RadioButtonList
  - Repeater
  - DataList
  - DataGrid
  - Dropdownlist
- Rich controls
  - AdRotator
  - Calendar
  - Xml

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q7-12, 16, 29, 30
2 Unit II, Section III Q5, 12, 15, 21

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 59-118, 121-162, 180-212

REFERENCE BOOKS:

1 ibid 2, Page No. 129-161, 163-191
2 ibid 6, Page No. 129-168, 213-232

WEBSITES:

1 http://www.w3schools.com/aspnet/aspnet_refwebcontrols.asp
2 http://delphi.about.com/od/aspnet/l/aa091404a.htm
3 http://support.microsoft.com/kb/306459#2b
4 http://www.tutorialspoint.com/asp.net/asp.net_html_server.htm

LECTURES 26-27

WORKING WITH MASTER PAGES

OBJECTIVE:

The objective of these lectures is to learn about the need of master pages and how to create and apply them on web pages.

CONTENTS:

- ➢ Need for Master Pages
- ➢ Creating Master Pages
  - o Simple Master Pages
  - o Nested Master Pages

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q 31
2 Unit II, Section III Q22

SUGGESTED READING:

REFERENCE BOOK:

1 ibid 6, Page No. 643-657

LECTURES 28-32

WORKING WITH ADO.NET

OBJECTIVE:

The objective of the lectures is to introduce the core data access library for .NET developers i.e. ADO.NET.

CONTENTS:

- Introduction to ADO.NET
- Components of ADO.NET
- Data binding to web controls
  - DropDownList web control
  - CheckBoxList web control
  - RadioButtonList web control
  - ListBox web control
- Working with Database Controls
  - GridView Control
  - DataList Control
  - Repeater Control
  - FormView Control
  - ListView Control
- Working with Datasets
- Working with XML

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q13-15, 17, 21-22, 26-28, 32
2 Unit II, Section III Q6-10, 16-20

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 337-375, 623-657, 843-908

REFERENCE BOOKS:

1 ibid 2, Page No. 425-471,473-509,511-549
2 ibid 6, Page No. 293-400

WEBSITES:

1 http://etutorials.org/Programming
2 http://www.expertrating.com/courseware/DotNetCourse/DotNet-ASP.Net-9-2.asp
3 http://www.expertrating.com/courseware/DotNetCourse/DotNet-ASP.Net-10-1.asp

ARTICLE:

1 Toni Stojanovski, Marko Vučković, Ivan Velinov, "Empirical Study of Performance of Data Binding in ASP.NET Web Applications", Conference on Electronics, Telecommunications and Computer Science ETAI 2011, http://arxiv.org/ftp/arxiv/ papers /1201/1201.0357.pdf

LECTURES 33-34

TRACKING USER SESSIONS

OBJECTIVE:

The lectures give an insight of different methods used for tracking user sessions in ASP.NET.

CONTENTS:

- What is session
- Session Modes
  - InProc
  - StateServer
  - SQLServer
  - Custom
- Advantages and Disadvantages of Sessions
- Methods for tracking user sessions
  - Using Browser Cookies
  - Using Session State
  - Using Profiles

ASSIGNMENTS FROM QUESTION BANK:

1 Unit III, Section II Q1, 4, 9-14, 15
2 Unit III, Section III Q1, 6-13, 16-18

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 1264-1331.

REFERENCE BOOK:

1 ibid 2, Page No. 233-268.

WEBSITE:

1 http://www.developertutorials.com/tutorials/java/implement-session-tracking-050611-1110/

LECTURE 35

APPLICATION TRACKING AND ERROR HANDLING

OBJECTIVE:

ASP.NET applications must be able to handle errors that occur during execution in a consistent manner. The lecture discusses the various aspects of error handling.

CONTENTS:

- ➢ Error Handling in ASP.NET
  - o Tracing
  - o Error Handling
    - ▪ Page Level
    - ▪ Application Level
  - o Debugging

ASSIGNMENT FROM QUESTION BANK:

1 Unit III, Section II Q12

SUGGESTED READINGS:

REFERENCE BOOK:

1 ibid 6, Page No. 979-999

WEBSITE:

1 http://www.tutorialspoint.com/asp.net/asp.net_error_handling.htm

LECTURES 36-37

CACHING ASP.NET APPLICATIONS

OBJECTIVE:

One of the most important factors in building high-performance, scalable Web applications is the ability to store items, whether data objects, pages, or parts of a page, in memory the initial time they are requested. The lectures discuss the various types of caching methods used for this purpose in ASP.NET.

CONTENTS:

- ➢ Introduction to Caching
- ➢ Types of Caching
  - o Page Output Caching
  - o Partial Page Caching
  - o Data Source Caching

- Data Caching

ASSIGNMENTS FROM QUESTION BANK:

1 Unit III, Section II Q2,12,19
2 Unit III, Section III Q2, 5,15

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 1335-1397

REFERENCE BOOKS:

1 ibid 2, Page No. 729-751
2 ibid 6, Page No. 737-764

LECTURES 38-41

SECURING ASP.NET APPLICATIONS

OBJECTIVE:

Authentication is the process of obtaining identification credentials such as name and password from a user and validating those credentials against some authority. ASP.NET implements authentication through authentication providers, the code modules that contain the code necessary to authenticate the requestor's credentials. The topics in this lecture describe the authentication providers and the login controls built into ASP.NET.

CONTENTS:

- ➢ Introduction to Authentication
- ➢ Types of Authentication
  - Windows
  - Passport
  - Forms
- ➢ Login controls in ASP.NET
  - Login control
  - LoginView control
  - LoginStatus control
  - LoginName control
  - PasswordRecovery control
  - CreateUserWizard control
  - ChangePassword control
- ➢ Cryptography in .NET
  - The System. Security. Cryptography Namespace

- Encryption and Decryption

ASSIGNMENTS FROM QUESTION BANK:

1 Unit III, Section II Q5, 7, 8, 16-18, 20
2 Unit III, Section III Q3, 4, 14

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 1147-1201, 1206-1259

REFERENCE BOOKS:

1 ibid 2, Page No. 615-674
2 ibid 6, Page No. 1027-1056, 1134-1181

WEBSITES:

1 http://www.expertrating.com/courseware/DotNetCourse/DotNet-ASP.Net-11-1.asp
2 http://www.expertrating.com/courseware/DotNetCourse/DotNet-ASP.Net-12-1.asp
3 http://msdn.microsoft.com/en-us/library/ms178329.aspx

LECTURES 42-45

INTRODUCTION TO WEB SERVICES

OBJECTIVE:

Web Services are the underpinning of Microsoft's .NET strategy. The concepts and the innovations behind this initiative have struck a chord with developer's building the next generation of Internet applications. The lectures focus on the architecture and components of web services.

CONTENTS:

- ➢ Introduction to web services
- ➢ Introduction to Service Oriented Architecture
- ➢ XML basics
- ➢ Components of Web Services
  - Simple Object Access Protocol(SOAP)
    - SOAP message structure
      - Envelope element
      - Header element
      - Body element
      - Fault element

- Web Services Description Language(WSDL)
  - WSDL document structure
    - <types>
    - <message>
    - <portType>
    - <binding>
- UDDI
- Discovery or .Disco files

ASSIGNMENTS FROM QUESTION BANK:

1 Unit IV, Section II Q1-4, 9-11, 13-14, 18-21
2 Unit IV, Section III Q1-3, 6, 7, 9-12, 17, 20

SUGGESTED READINGS:

WEBSITES:

1 http://tutorials.jenkov.com/soa/soa.html
2 http://www.csd.uoc.gr/~hy565/newpage/docs/pdfs/papers/wsca.pdf
3 http://www.win.tue.nl/~ymazuryk/docs/soa.pdf
4 http://www.w3schools.com/soap/soap_intro.asp
5 http://www.w3schools.com/wsdl/wsdl_uddi.asp
6 http://www.w3schools.com/wsdl/wsdl_documents.asp
7 http://nsfcac.rutgers.edu/TASSL/Papers/proc-ieee-intro-04.pdf(grid)
8 http://www.jatit.org/volumes/research-papers/Vol9No1/10Vol9No1.pdf(cloud)

ARTICLES:

1 SnehalMumbaikar, Puja Padiya," Web Services Based On SOAP and REST Principles", International Journal of Scientific and Research Publications, Volume 3, Issue 5, May 2013, http://www.ijsrp.org/research-paper-0513/ijsrp-p17115.pdf
2 YuZhangJian-PingAnPanChen,Research of Hybrid Programming with C#.net and Matlab,https://doi.org/10.1016/j.phpro.2012.02.247

LECTURES 46-47

HOW TO CREATE AND CONSUME A WEB SERVICE

OBJECTIVE:

The lectures explain how the web services are created and consumed in ASP.NET.

CONTENTS:

- ➢ Basics for creating Web Services in ASP.NET

- .asmx file
- The WebService directive
- The WebService class
- The WebMethod attribute
- Using http://tempuri.org/ Namespace

➢ Creating the Web Service
➢ Running the Web Service
➢ Consuming the Web Service

ASSIGNMENT FROM QUESTION BANK:

1 Unit IV, Section III Q 19

SUGGESTED READINGS:

REFERENCE BOOK:

1 ibid 6, Page No. 837-855

WEBSITES:

1 http://www.w3schools.com/webservices/ws_example.asp
2 http://www.codeproject.com/Articles/1231/ASP-NET-Web-Service
3 http://www.aspdotnet-suresh.com/2011/05/aspnet-web-service-or-creating-and.html

ARTICLE:

1 Kishor Wagh, Ravindra Thool, "Mobile Web Service Provisioning and Performance Evaluation of Mobile Host", International Journal on Web Service Computing (IJWSC), Vol.5, No.2, June 2014, http://airccse.org/journal/jwsc/papers/5214ijwsc01.pdf

LECTURES 48-51

OVERVIEW OF GRID COMPUTING AND CLOUD COMPUTING

OBJECTIVE:

Grid computing, cloud computing and software as a service are emerging technologies predicted to result in massive consolidation as meta-level computing services of everything beneath one umbrella in the future. The purpose of these lectures is to provide an overview of the above mentioned computing technologies.

CONTENTS:

➢ Overview of Grid computing
- Difference between traditional and grid computing
- Layers of grid computing
  - Fabric layer

        - Connectivity layer
        - Resource layer
        - Collective layer
        - Application layer
    - Benefits of grid computing
    - Grid computing technologies
        - Server virtualization
        - Clustering
- Overview of Cloud computing
    - Cloud computing models
        - Software as a Service(SaaS)
        - Platform as a Service(PaaS)
        - Infrastructure as a Service(IaaS)
    - Layers in cloud computing
        - Fabric layer
        - Unified resource layer
        - Platform layer
        - Application layer
    - Types of clouds
        - Public clouds
        - Private clouds
        - Hybrid clouds
    - Benefits of cloud computing

ASSIGNMENTS FROM QUESTION BANK:

1 Unit IV, Section II Q5-8, 12, 15, 16, 17
2 Unit IV, Section III Q5, 8, 13-16, 18

SUGGESTED READINGS:

WEBSITES:

1 http://nsfcac.rutgers.edu/TASSL/Papers/proc-ieee-intro-04.pdf
2 http://www.jatit.org/volumes/research-papers/Vol9No1/10Vol9No1.pdf

ARTICLES:

1 Harman Preet Singh, ArvindBhisikar, Jitendra Singh, "Innovative ICT Through Cloud Computing", The IUP Journal of Computer Sciences, Vol. 7, No. 1, January 2013, pp 37-52.
2 ShailjaTripathi. NasinaJigeesh,"A Review of factors that affect Cloud Computing Adoption", The IUP Journal of Computer Sciences, Vol. 7, No. 4, October 2013, pp 48-59.
3 GanesaMuthy M., Venkatesh S., "Secured Access in Cloud Computing", International Journal of Computer Science & Knowledge Engineering,Volume 8, Number 1, Jan-June 2014, pp 103-118.
4 Raj Kumar Maurya, "Setup Your Personal Cloud Storage with OwnCloud ", PCQuest, November 2014, pp 50-51.

5 Khaleel Mershad ; Hassan Artail ; Mazen A. R. Saghir ; Hazem Hajj ; Mariette Awad,A Study of the Performance of a Cloud Datacenter Server,Year: 2017,IEEE Transactions on Cloud Computing Page(s):590- 603.
6 IrfanHussain, Imran Ashraf , "Security Issues in Cloud Computing-A Review" , International Journal of Advanced Networking and Applications, Volume 6, Issue 2, Sep-Oct 2014, pp 2240-2243.