**Shri Vaishnav Vidyapeeth Vishwavidyalaya**
**Shri Vaishnav Institute Of Information Technology**
**Master of Technology (Computer Science Engineering)**
**Choice Based Credit System (CBCS)-2022-24**
**SEMESTER-I**

| COURSE CODE | CATEGORY | COURSE NAME | L | T | P | CREDITS | TEACHING & EVALUATION SCHEME | | | | |
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| **MTMA101** | | **ADVANCE MATHEMATICS** | 3 | - | - | 3 | 60 | 20 | 20 | - | - |

**Legends**: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives (CEOs):

1. To make students to understand mathematics' fundamentals necessary to formulate, solve and analyze engineering problems.
2. To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
3. To familiarize the student with functions of several variables and distributions functions. This is needed in many branches of engineering.
4. To acquaint the student with mathematical models needed in evaluating multiple integrals and their usage.
5. To familiarize the students with fuzzy logic and its applications.

### Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to

1. Understanding the ideas of differential equations and facility in solving simple standard examples.
2. Students will demonstrate basic knowledge of Laplace Transform. Fourier Series, Bessel Functions, Vector Algebra and Complex Variable.
3. Students will understand the concept of integration using standard methods, including the ability to find an appropriate method for a given integral.
4. Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
5. Students will demonstrate the various applications subject to fuzzy relations and various queuing models.

## Syllabus

**UNIT I** **10HRS**

Linear Algebra: Linear transformation, vector spaces, hash function, Hermite polynomial, Heavisite's unit function and error function. Elementary concepts of Modular mathematics

**UNIT II** **9HRS**

Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE (Laplace, Poisson's, Parabolic) using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

**UNIT III** **8HRS**

Probability, compound probability and discrete random variable, Binomial, Normal and Poisson's distributions, Sampling distribution, elementary concept of estimation and theory of hypothesis, recurred relations.

**UNIT IV** **7HRS**

Stochastic process, Markov process transition probability transition probability matrix, just and higher order Markov process, Application of Eigen value problems in Markov Process, Markov chain. Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/ Infinity/ FC FS), (M/M/1: N/ Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FC FS)

**UNIT V** **8HRS**

Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations, fuzzy logics, MATLAB introduction, programming in MATLAB scripts, functions and their application

**References:**

1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.
3. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH.
4. Advance Engg Mathematics, O' Neil, Cengage (Thomson)
4. Introductory Methods of Numerical Analysis by S.S. Shastry,
5. Introduction of Numerical Analysis by Forberg
6. Numerical Solution of Differential Equation by M. K. Jain
7. Numerical Mathematical Analysis By James B. Scarborogh
8. Fourier Transforms by J. N. Sheddon
9. Fuzzy Logic in Engineering by T. J. Ross
10. Fuzzy Sets Theory & its Applications by H. J. Zimmersoms

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| **MTCS102** | | **ADVANCE DATA STRUCTURES & ALGORITHMS** | 3 | - | 2 | 4 | 60 | 20 | 20 | 30 | 20 |

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives (CEOs):

1. Ability to analyze asymptotic runtime complexity of algorithms including formulating r recurrence relations
2. Basic knowledge of computational complexity, approximation and randomized algorithms
3. Ability to understand and design algorithms using , greedy strategy, divide and conquer approach, dynamic programming, and max flow - min cut theory.
4. Apply important algorithmic design paradigms and methods of analysis. Demonstrate a familiarity with major algorithms and data structures.
5. Basic knowledge of graph and matching algorithms

### Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to

1. Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class
2. Master a variety of advanced abstract data type (ADT) and data structures and their implementations.
3. Master different algorithm design techniques (brute force, divide and conquer, greedy, etc.)
4. Ability to apply and implement learned algorithm design techniques and data structures to solve problems.

## Syllabus

### UNIT I 10HRS

Basic concepts- Algorithm Specification-Introduction, Recursive algorithms, Data Abstraction Performance analysis- time complexity and space complexity, Asymptotic Notation-Big O, Omega and Theta notations, Introduction to Linear and Non Linear data structures. Singly Linked Lists-Operations-Insertion, Deletion, Concatenating singly linked lists, Circularly linked lists-Operations for Circularly linked lists, Doubly Linked Lists- Operations- Insertion, Deletion. Representation of single, two dimensional arrays, sparse matrices-array and linked representations.

### UNIT II 9HRS

Stacks and Queue- Stack ADT, definition, operations, array and linked implementations in C, applications infix to postfix conversion, Postfix expression evaluation, recursion implementation, Queue ADT, definition and operations ,array and linked Implementations in C, Circular queues-Insertion and deletion operations, Dequeue (Double ended queue)ADT, array and linked implementations in C.

**UNIT III** 8**HRS**

Trees – Terminology, Representation of Trees, Binary tree ADT, Properties of Binary Trees, Binary Tree Representations-array and linked representations, Binary tree traversals, Threaded binary trees, Max Priority Queue ADT-implementation-Max Heap-Definition, Insertion into a Max Heap, Deletion from a Max Heap. Graphs – Introduction, Definition, Terminology, Graph ADT, Graph Representations- Adjacency matrix, Adjacency lists, Graph traversals- DFS and BFS.

**UNIT IV** **7HRS**

Searching- Linear Search, Binary Search, Static Hashing-Introduction, hash tables, hash functions, Overflow Handling. Sorting-Insertion Sort, Selection Sort, Radix Sort, Quick sort, Heap Sort, Comparison of Sorting methods.

**UNIT V** **8HRS**

Search Trees-Binary Search Trees, Definition, Operations- Searching, Insertion and Deletion, AVL Trees Definition and Examples, Insertion into an AVL Tree ,B-Trees, Definition, B-Tree of order m, operations Insertion and Searching, Introduction to Red-Black and Splay Trees(Elementary treatment-only Definitions and Examples), Comparison of Search Trees. Pattern matching algorithm- The Knuth-Morris-Pratt algorithm, Tries (examples only).

**Reference:**

Introduction to Algorithms 3rd ed, by Cormen, Leiserson, Rivest, and Stein
Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson P
Aho, Hopcroft, Ullman, “Data Structures and Algorithms”, Pearson Education P
Drozdek, Data Structures and algorithm in Jawa, Cengage (Thomson)
Gilberg, Data structures Using C++, Cengage
Horowitz, Sahni, Rajasekaran, “Computer Algorithms”, Galgotia,
Tanenbaum A.S., Langram Y, Augestien M.J., ”Data Structures using C & C++”,Prentice

**Practical’s List:**

1. Implement Recursive Binary Search and Linear Search and determine the time required to search an element. Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.
2. Sort a given set of elements using the Heapsort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken.
3. Sort a given set of elements using Merge sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
4. Sort a given set of elements using Selection sort and determine the time required to sort elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted

and plot a graph of the time taken versus n.

5. Obtain the Topological ordering of vertices in a given digraph.
6. Implement All Pair Shortest paths problem using Floyd's algorithm.
7. Implement 0/1 Knapsack problem using dynamic programming.
8. From a given vertex in a weighted connected graph, find the shortest paths to other vertices using Dijkstra's algorithm.
9. Sort a given set of elements using Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
10. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

11. Print all the nodes reachable from a given starting node in a digraph using BFS method.
12. Check whether a given graph is connected or not using DFS method.
13. Find a subset of a given set S= {s1, s2, Sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S = {1,2,5,6,8} and d=9 there are two solutions {1,2,6} and {1,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.
14. Implement Horspool algorithm for String Matching.
15. Find the Binomial Co-efficient using Dynamic Programming.
16. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
17. Implement Floyd's algorithm for the All-Pairs-Shortest-Paths problem.
18. Compute the transitive closure of a given directed graph using Warshall's algorithm.
19. Implement N Queen's problem using Back Tracking.

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| **MBAI301C** | | **Advance Human Values and Professional Ethics** | **3** | **-** | **-** | **3** | **60** | **20** | **20** | **-** | **-** |

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**Course Educational Objectives (CEOs):**
The objective of the course is to disseminate the theory and practice of moral code of conduct and familiarize the students with the concepts of "right" and "good" in individual, social and professional context.

**Course Outcomes (COs):**

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to

1. Help the learners to determine what action or life is best to do or live.
2. Right conduct and good life.
3. To equip students with understanding of the ethical philosophies, principles, models that directly and indirectly affect business.

**SYLLABUS**

**UNIT–I** **10HRS**
**Human Value**

1. Type of Values –competent
2. Instrumental, terminal
3. Extrinsic & intrinsic values; Hierarchy of values; Dysfunctionality of values
4. Basis of values: Philosophical, Psychological and socio-cultural

**UNIT–II** **9HRS**
**Theories of Value Development**

1. Psycho-analytic
2. Learning theory –social leaning

3. Models of Value Development
4. Value Analysis
5. Inquiry
6. Social Action

**UNIT–III** **8HRS**

**Professional Ethics**

1. Meaning
2. Objectives
3. Sources of Ethics
4. Ethics V/s Morals and Values
5. Ethico-Moral Action
6. Theories of Ethics, Codes of Ethics

**UNIT–IV** **7HRS**

**Human Behavior – Indian Thoughts**

1. Guna Theory
2. Sanskara Theory
3. Karma Theory
4. Nishkama Karma Yoga and Professionalism

**UNIT–V** **8HRS**

**Globalization and Ethics**

1. Impact of globalization on Indian corporate and social culture
2. Corporate Citizenship
3. Environmental Protection
4. Social Welfare and Community Development Activities

## SUGGESTED READINGS:

1. Beteille, Andre (1991). **Society and Politics in India**. New Jersey: Athlone Press
2. Chakraborty, S. K. (1999). **Values and Ethics for Organizations**. oxford university press
3. Fernando, A.C. (2009). **Business Ethics - An Indian Perspective .**India: Pearson Education, India
4. Fleddermann, Charles D. (2012). **Engineering Ethics**. New Jersey: Pearson Education / Prentice Hall.
5. Boatright, John R (2012). **Ethics and the Conduct of Business**. New Delhi: Pearson. Education.
6. Crane, Andrew and Matten, Dirk (2015). **Business ethics**. New York. : Oxford University Press Inc.
7. Murthy, C.S.V. (2016). Business **Ethics – Text and Cases**. Mumbai: Himalaya Publishing House Pvt. Ltd.
8. Naagrajan, R.R (2016). **Professional Ethics and Human Values**. New Delhi: New Age International Publications.

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| | | | | | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* |
| **MTCS111** | | **Data Mining & Warehousing** | 2 | - | 2 | 3 | 60 | 20 | 20 | - | 50 |

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives (CEOs):

1. To understand the basic principles, concepts and applications of data mining.
2. To identify and implement several methods to enhance and develop information systems and to manage the information system resources.
3. To develop skills of using recent data mining software for solving practical problems.
4. To gain experience of doing independent study and research.

### Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to

1. Show how to plan, acquire, and maintain information systems using data mining techniques.
2. Identify components in typical data mining architecture.
3. Understand typical knowledge discovery process and the different algorithms available by popular commercial data mining software.
4. Obtain hands-on experience with some popular data mining software.

## Syllabus

**UNIT I** **10HRS**

Data Mining: Introduction, KDD v/s Data Mining, stages of data mining process, Functionalities of data, task primitives, Pre-processing, Issues and Challenges, Application areas.

**UNIT II** **9HRS**

Data mining Algorithms: classification – Basic concepts, IR rules, Classification techniques, Decision tree, Covering rules, Model evaluation, practical issues.
Clustering – Algorithms: Cluster/2, Partitioning methods, hierarchical methods, conceptual method. cluster analysis. outlier analysis.

**UNIT III** **8HRS**

Association Algorithms: Rules, item sets, Generating item sets and rules, mining association, Correlation analysis.
Prediction- Instance-based (nearest neighbour), Statistical (naive bayes), Bayesian networks, linear

model.

**UNIT IV** **7HRS**

Other DM tools and techniques & Web Mining – Fuzzy C-Mean algorithm, Genetic algorithm, Web Mining, Web content mining, Web structure Mining, Web Usage Mining. Temporal and spatial data mining, Training and testing data

**UNIT V** **8HRS**

Text mining, Data Mining of Image and Video: A case study. Image and Video representation techniques, feature extraction and selection, motion analysis, content based image and video retrieval, measuring the effectiveness of data mining techniques. Market baskets analysis, automatic cluster detection, link analysis, generic algorithms, data mining and corporate data warehouse, OLAP, Data mining software.

## Text Books:

1. "Introduction to data mining" by Tan, Steinbach & Kumar (2006), Pearson Publication.
2. Data Mining: Concepts and Techniques, Third Edition by Han, Kamber & Pei (2013)
3. Data Mining Techniques ; Arun K.Pujari ; University Press.
4. Data Mining; Adriaans & Zantinge; Pearson education.
5. Mastering Data Mining; Berry Linoff; Wiley.
6. Data Mining- The textbook, Charu C. Agrawal,Springer.
7. Text Mining Applications, Konchandy, Cengage

## Practical's List:

1. Introduction about launching the Weka tool.
2. Introduction to Weka Explorer.
3. Introduction to the classification of Mining techniques.
4. Introduction to Attribute Relation File Format (ARFF).
5. Analysis of weather data
6. Experiment on mining association rules
7. Preprocessing, Classification and Visualization technique experiment on data set.
8. Experiments on decision trees, rules
9. Experiments with Weka on Prediction
10. Demonstration of clustering rule process on dataset using k-mean.
11. Demonstration of Association rule process on dataset test.arff using apriori algorithm.
12. To perform Clustering technique on Customer dataset.
13. To perform Association technique on Agriculture dataset.
14. To perform classification technique on Weather dataset.

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| **MTCS112** | | **Object Oriented Analysis & Design** | 2 | - | 2 | 3 | 60 | 20 | 20 | - | 50 |

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### Course Educational Objectives (CEOs):

1. Learn the basics of OO analysis and design skills.
2. Learn the UML design diagrams.
3. Learn to map design to code.
4. Be exposed to the various testing techniques.

### Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to

1. Design and implement projects using OO concepts.
2. Use the UML analysis and design diagrams.
3. Apply appropriate design patterns.
4. Create code from design.
5. Compare and contrast various testing techniques.

## Syllabus

**UNIT I** **10HRS**

Introduction to OOAD , Unified Process - UML diagrams , Use Case , Class Diagrams, Interaction Diagrams , State Diagrams , Activity Diagrams , Package, component and Deployment Diagrams.

**UNIT II** **9HRS**

GRASP: Designing objects with responsibilities , Creator , Information expert , Low Coupling , High Cohesion , Controller - Design Patterns , creational - factory method -structural , Bridge , Adapter - behavioral , Strategy , observer.

**UNIT III** **8HRS**

Reusing Pattern Solutions , Concepts , Activities , Managing Reuse , Case Study - Specifying Interfaces , Concepts , Activities , Management , Case Study - Mapping Models to Code ,

Concepts , Activities , Management ,Case Study , Testing , Concepts , Activities , Management.

**UNIT IV** **7HRS**

System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram , Logical architecture refinement , UML class diagrams , UML interaction diagrams - Applying GoF design patterns.

**UNIT V** **8HRS**

Mapping design to code , Testing: Issues in OO Testing , Class Testing , OO Integration Testing , GUI Testing , OO System Testing.

## Text Books:

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005.
2. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
3. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley, 1995.

## References:

1. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third edition, Addison Wesley, 2003.
2. Paul C. Jorgensen, "Software Testing:- A Craftsman's Approach", Third Edition, Auerbach Publications, Taylor and Francis Group, 2008.

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| **MTCS113** | | **Internet Of Things** | 2 | - | 2 | 3 | 60 | 20 | 20 | - | 50 |

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives (CEOs):

The objective of the course is to:
1. Vision and Introduction to IoT.
2. Understand IoT Market perspective.
3. Data and Knowledge Management and use of Devices in IoT Technology.
4. Understand State of the Art – IoT Architecture.
5. Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

### Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.
The students will be able to
1. Understand the vision of IoT from a global context.
2. Determine the Market perspective of IoT.
3. Use of Devices, Gateways and Data Management in IoT.
4. Building state of the art architecture in IoT.
5. Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints

## Syllabus

**UNIT I** **10HRS**

Introduction to the internet of things – origins, early concepts and products, Examples of current products and value propositions, Architectures and design patterns, Analysis of a full connected-object experience. State of the Art, challenges and future directions

**UNIT II** **10HRS**

Prototyping connected objects - open-source prototyping platforms, Basic arduino programming, Extended Arduino libraries. Arduino-based Internet communication, Practical activities,

**UNIT III** **8HRS**

Integrating internet services xml and json http apis for accessing popular Internet services (Facebook, Twitter, and others). Practical activities.

**UNIT IV** **7HRS**

User Experience And Interaction Design - The three levels of user engagement: aesthetics, functional and emotional. Good examples of user interaction design. Designing your own user experience Practical activities

**UNIT V** **8HRS**

Project Development And Competition - Development of a project including: value proposition, physical connected object prototyping, programming the behaviour, accessing Internet services and designing the user experience. Project competition

**Text books:**

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

**Practical's List:**

1. Write an Arduino code Connect an external LED to the Arduino, blink it on a multiple rate. Connect a push button and trigger the LED.
2. Write an Arduino code using analogWrite and analog Read function to control the brightness of a LED using PWM enabled pin and Potentiometer.
3. Develop an application of home automation using LDR to automatically control the switching of LED based upon the brightness level.
4. Write an Arduino code to print some numbers/data on serial monitor and log the event timing. (take a reference from arduino.cc ).
5. Read current Room Temperature in Celsius.
6. Note down the change in temperature by putting your finger on IC.

(Temperature will be increased because of body temperature )

7. Change the resolution of TMP75 and note down changes (if any).
8. Configure TMP75 in Shut Down Mode and One Shot Mode.
9. Use Compara tor mode and Interrupt mode using ALERT pin.
10. Perform Daisy Chaining (Connect multiple TMP75 with one Arduino board)

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| **MTCS115** | **PG** | **Big Data Analysis** | 2 | - | 2 | 3 | 60 | 20 | 20 | - | 50 |

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### Course Educational Objectives (CEOs):

1. To develop professionals required to meet the needs of the industry in processing voluminous data
2. To promote an academic career for further research in theoretical as well as applied aspects of Big Data Analytics in providing an innovative, cost-effective processing of information for enhanced insight & decision making
3. To develop the spirit of entrepreneurship in providing solutions in this emerging domain
4. To generate professional who are good in core competency skills of Computer Science & Engineering as well as Big Data Analytics

### Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.
The students will be able to

1. Be able to apply the knowledge of computing tools and techniques in the field of Big Data for solving real world problems encountered in the Software Industries.
2. Be able to analyze the various technologies & tools associated with Big Data.
3. Be able to identify the challenges in Big Data with respect to IT Industry and pursue quality research in this field with social relevance.

## Syllabus

**UNIT I** **10HRS**

INTRODUCTION TO BIG DATA 7 Big Data and its Importance , Four V's of Big Data , Drivers for Big Data , Introduction to Big Data Analytics , Big Data Analytics applications. Data science process , roles, stages in data science project , working with data from files , working with relational databases , exploring data , managing data , cleaning and sampling for modeling and validation , introduction to NoSQL

**UNIT II** **9HRS**

Choosing and evaluating models , mapping problems to machine learning, evaluating clustering models, validating models , cluster analysis , K-means algorithm, Naïve Bayes , Memorization

Methods , Linear and logistic regression , unsupervised methods. BIG DATA TECHNOLOGIES 8 Hadoop's Parallel World , Data discovery , Open source technology for Big Data Analytics , cloud and Big Data ,Predictive Analytics , Mobile Business Intelligence and Big Data , Crowd Sourcing Analytics , Inter- and Trans-Firewall Analytics - Information Management.

**UNIT III** **8HRS**

P Reading and getting data into R , ordered and unordered factors , arrays and matrices , lists and data frames , reading data from files , probability distributions , statistical models in R - manipulating objects , data distribution. ROCESSING BIG DATA 7 Integrating disparate data

stores - Mapping data to the programming framework - Connecting and extracting data from storage - Transforming data for processing - Subdividing data in preparation for Hadoop Map Reduce.

**UNIT IV** **7HRS**

HADOOP MAPREDUCE, Employing Hadoop Map Reduce - Creating the components of Hadoop Map Reduce jobs - Distributing data processing across server farms -Executing Hadoop Map Reduce jobs - Monitoring the progress of job flows - The Building Blocks of Hadoop Map Reduce - Distinguishing Hadoop daemons - Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

**UNIT V** **8HRS**

ADVANCED ANALYTICS PLATFORM 7 Real-Time Architecture , Orchestration and Synthesis Using Analytics Engines , Discovery using Data at Rest , Implementation of Big Data Analytics , Big Data Convergence , Analytics Business Maturity Model.BIG DATA TOOLS AND TECHNIQUES 8 Installing and Running Pig , Comparison with Databases , Pig Latin , UserDefine Functions , Data Processing Operators , Installing and Running Hive , Hive QL , Tables , Querying Data , User-Defined Functions , Oracle Big Data.

**Text Books :**

1. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
2. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.
4. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.

**Practical's List:**

1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux.

2. Configuration of a multi-node Hadoop cluster(one master and multiple slaves). 3

3. MapReduce application for word counting on Hadoop cluster
4. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
5. K-means clustering using map reduce
6. Page Rank Computation
7. Mahout machine learning library to facilitate the knowledge build up in big data analysis.
8. Application of Recommendation Systems using Hadoop/mahout libraries.
9. Application of SPARK for data analysis.
10. Applicaion of HIVE for Data analytics.

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**SEMESTER-I**

| COURSE CODE | CATEGORY | COURSE NAME | L | T | P | CREDITS | TEACHING & EVALUATION SCHEME | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | THEORY | | PRACTICAL | | |
| | | | | | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* |
| **MTCS121** | | **Web Technology & E-commerce** | 2 | - | 2 | 3 | 60 | 20 | 20 | 30 | 20 |

**Legends**: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives (CEOs):

1. Student shall be able to determine the importance and building blocks of "Web Technology" and "E-Commerce" and study of various networking protocols.
2. Student shall be able to apply the knowledge of various web technologies like Server-side, Client-side etc. to multidisciplinary areas for developing effective websites.
3. Student shall be able to describe and implement the concepts of E-commerce, its various business models and advanced Security Techniques.
4. Student shall be able to implement advanced on-line payment Systems and security techniques to resolve hacking issues.

### Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.
The students will be able to

1. Ability to determine the importance of "Web Technology" and "E-Commerce" and study of various protocols related to same.
2. Ability to design, develop and deploy the effective websites in multidisciplinary areas.
3. Ability to implement the concept of E-commerce web-site and its models.
4. Able to implement advanced on-line payment Systems and security techniques.

## Syllabus

**UNIT I** **10HRS**

Building blocks of E-Commerce: Internet and Networking LAN, MAN, WAN, VPN. Technologies, IP addressing Class full and Classless, Protocols IP, ARP, RARP, TCP, UDP, SMTP, BOOTP, DHCP, ICMP, DNS, TFTP, TELNET

**UNIT II** **9HRS**

Static and dynamic web pages: Structure of web pages, Linking, Anchor Attributes, Image Maps, Meta Information, Image Preliminaries, Layouts, Backgrounds, Colors and Text, Fonts, Tables,

Frames and layers, Image, Audio and Video Support, tiers, plug-ins, frames and forms. Exposure to Markup languages, HTML, DHTML, VRML, SGML, XML etc CGI, Applets & Servlets, JSP & JAVA Beans, active X control, ASP cookies creating and reading cookies, web personalization, semantic web, semantic web services, ontology, Comparative case study of Microsoft and JAVA technologies, web server scalability, Distributed objects, object request brokers, component technology, Web services, Web application architectures, Browsers, Search engines.

**UNIT III** **8HRS**

Electronic Commerce and Physical Commerce: Different type of e-commerce, e-commerce scenarios, advantages of e-commerce. Business models: Feature of B2B, B2C, G2C etc. e-commerce Business models, Integration. E-Services: category of e-services, Web- enabled services, Matchmaking services, information-selling on the web.

**UNIT IV** **7HRS**

Internet payment system: Characteristics of payment system, 4C payments methods, SET Protocol for credit card payment, Internet Banking, RTGS, NEFT, E-cash, E-check, Micro payment system, Overview of smart card, overview of Mondex. E-Governance: E-Governance architecture, Public private partnership, Readiness, Security, Cyber Crime and Cyber Law, IT Act

**UNIT V** **8HRS**

Advaced technologies for e-commerce: Introduction to mobile agents. WAP: the enabling technology:
The WAP model, WAP Architecture, Benefit of WAP to e-commerce, Web Security, Encryption Schemes, Secure Web documents, Digital signatures and firewalls

**Demand:**

1. Building Web Portals, Web-sites, Web-applications, Apps. etc,
2. Implementing the E-Commerce Websites.
3. Implementing the Advanced Payment Systems and Security Techniques.
4. Handling and maintaining all the activities happening in Web-site over the Internet and many more.

**Reference:**

1. Web Technology, Achyut Godbole, Atul Kahate, TMH.
2. Henry Chan, Raymond Lee, Tharam Dillon , E-Commerce Fundamental and Applications, Willey
3. Publication.
4. Minoli & Minoli, Web Commerce Technology Hand Book, TMH.
5. Satyanarayana, E-Government, PHI
6. Uttam K: Web Technologies, Oxford University Press.
7. G. Winfield Treese, Lawrence C. Stewart, Designing Systems for Internet Commerce, Longman Pub.
8. Charles Trepper, E Commerce Strategies, Microsoft Press.

**Practical's List:**

1. At least 10 lab experiments based on above syllabus, a mini project and a research paper is desirable to be completed cover following:
2. Installation and Configuration of Web Servers.
3. Home page design.

4. Form validation.
5. Catalog design and Search techniques.
6. Access control mechanism (session management).
7. E-Commerce Web-site.
8. Payment systems.
9. Security features.
10. Creating Web Site to integrate web Services.

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**SEMESTER-I**

| COURSE CODE | CATEGORY | COURSE NAME | L | T | P | CREDITS | TEACHING & EVALUATION SCHEME | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | THEORY | | PRACTICAL | | |
| | | | | | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* |
| **MTCS122** | **PG** | **Cloud Computing** | 2 | - | 2 | 3 | 60 | 20 | 20 | 30 | 20 |

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives (CEOs):

To impart fundamental concepts in the area of cloud computing

1. To impart knowledge in applications of cloud computing.
2. To gain competence in Map Reduce as a programming model for distributed processing of large datasets specifically.
3. To understand the features of cloud simulator apply different cloud programming model as per need.

### Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.
The students will be able to

1. Understanding the systems, protocols and mechanisms to support cloud computing.
2. Develop applications for cloud computing
3. Understanding the hardware necessary for cloud computing.
4. Design and implement a novel cloud computing application.

## Syllabus

**UNIT I** **10HRS**

Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.

**UNIT II** **9HRS**

Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages

**UNIT III** **8HRS**

Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)

**UNIT IV** **7HRS**

Cloud security reference model, How security gets integrated , Cloud security , Understanding security risks , Principal security dangers to cloud computing, Virtualization and multitenancy, Internal security breaches, Data corruption or loss, User account and service hijacking, Steps to reduce cloud security breaches, Steps to reduce cloud security breaches , Reducing cloud security , Encryption & Encrypting data , Symmetric key encryption, Asymmetric key encryption , Digital signature, What is SSL? ,Identity management: Detection and forensics, Identity management: Detection and Identity management, Benefits of identity, Encryption techniques.

**UNIT V** **8HRS**

Global storage management locations, scalability, operational efficiency. Global storage distribution; terabytes to pet bytes and greater. Policy based information management; metadata attitudes; file systems or object storage. Overview Review of Service Models, SWOT Analysis and Value Proposition ,General Cloud Computing Risks , Performance, Network Dependence, Reliability, Outages, and Safety Critical Processing ,Compliance and Information Security ,Value and Risk of Open Source Software , Cloud Computing Cost Analysis, Selecting an IaaS Provider Cloud Standards and Intercloud Interoperability. - Application Development : Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

**Text Books:**

1. Galloway, P. Haack, B. Wilson, K.S. Allen, and D. Matson , [ASP] Professional ASP.NET MVC 5 , Wiley, 2014
2. K. Hwang, G. Fox, and J. Dongarra , [HFD] Distributed and Cloud Computing , Morgan Kaufmann, 2011
3. K. Chodorow , [M] MongoDB: The Definitive Guide , O'Reilly, 2013
4. S. Krishnan , [WA] Programming Windows Azure: Programming the Microsoft Cloud , O'Reilly, 2010
5. J. Lowry , [WCF] Programming WCF Services: Mastering WCF Services and the Azure AppFabric Bus , O'Reilly, 2011

**Practical's List:**

1. Analyze the components of cloud computing showing how business agility in an organization can be created
2. Evaluate the deployment of web services from cloud architecture
3. Critique the consistency of services deployed from a cloud architecture
4. Compare and contrast the economic benefits delivered by various cloud models based on application requirements, economic constraints and business requirements.
5. Critically analyze case studies to derive the best practice model to apply when developing and deploying cloud based applications

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| COURSE CODE | CATEGORY | COURSE NAME | L | T | P | CREDITS | TEACHING & EVALUATION SCHEME | | | | |
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| | | | | | | | THEORY | | PRACTICAL | | |
| | | | | | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* |
| MTCS123 | | Natural Language Processing | 2 | - | 2 | 3 | 60 | 20 | 20 | 30 | 20 |

**Legends**: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

## Course Educational Objectives (CEOs):

1. Student shall be able to understand approaches to discourse, generation, dialogue and summarization with in Natural Language Processing.
2. Student shall be able to use core algorithms and data structures used in Natural Language Processing.
3. Student shall be able to build statistical NLP components, such as n-gram language models, text classifiers and part-of-speech taggers, that learn from such corpora.
4. Student shall be able to understand machine learning techniques used in NLP, including hidden Markov models and others.

## Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.
The students will be able to
1. Understand approaches to discourse, generation, dialogue and summarization with in Natural Language Processing.
2. Implement core algorithms and data structures used in Natural Language Processing.
3. Build statistical Natural Language Processing(NLP) components, such as N-gram language models, Text classifiers and Part-of-speech taggers, that learn from such corpora.
4. Use machine learning techniques used in NLP, including Hidden Markov Models (HMMs) and probabilistic context-free grammars, clustering and unsupervised methods as applied within NLP.

**UNIT I** **10HRS**

Introduction: Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Language, Thought, and Understanding, The State of the Art and The Near-Term Future, Some Brief History, Applications. The problem of ambiguity. The role of machine learning. Brief history of the field. **Words:** Regular Expressions and Automata, Morphology and Finite-State Transducers, N-grams Models, Hidden Markov and Maximum Entropy Models.

**UNIT II** **9HRS**

Speech: Phonetics, Computational Phonology and Text-to-Speech, Probabilistic Models of Pronunciation and Spelling, Speech Synthesis, Hidden Markov Models, Automatic Speech Recognition, Speech Recognition: Advanced Topics. Computational Phonology.

**UNIT III** **8HRS**

Syntax: Word Classes and Part-of-Speech Tagging, Formal Grammars and treebanks of English, Syntactic Parsing, Efficient parsing for context-free grammars (CFGs), Lexicalized and Probabilistic Parsing, Statistical parsing and probabilistic CFGs (PCFGs), Statistical Parsing, Features and Unification, Language and Complexity.

**UNIT IV** **7HRS**

Semantics and Pragmatics: The Representation of Meaning, Lexical semantics and Word-Sense Disambiguation(WSD), Word Net, Computational Semantics, Computational Lexical Semantics, Semantic Analysis, Compositional semantics, Semantic Role Labeling and Semantic Parsing, Computational Discourse.

**UNIT V** **8HRS**

Applications: Information Extraction (IE), Question Answering(QA) and Summarization, Word Sense Disambiguation, Dialog and Conversational Agents, Language Generation, Machine Translation (MT).

**Text Books:**

1. Jurafsky, David, and James H. Martin. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition. Upper Saddle River, NJ: Prentice-Hall, 2000. ISBN: 0130950696.
2. Manning, Christopher D., and Hinrich Schütze. Foundations of Statistical Natural Language Processing. Cambridge, MA: MIT Press, 1999. ISBN: 0262133601.

**References:**

1. Bird, S., Klein, E., Loper, E.(2009).Natural Language Processing with Python. Sebastopol, CA: O'Reilly Media.

**Practical's List:**

1. Program for morphological features of a word and its Analysis.
2. Program to generate word forms from root and suffix information.
3. Program to understand the morphology of a word by the use of Add-Delete table.
4. Program to calculate bi-grams from a given corpus and calculate probability of a sentence.
5. Program to to apply add-one smoothing on sparse bi-gram table.
6. Program to calculate emission and transition matrix which will be helpful for tagging Parts of Speech using Hidden Markov Model.
7. Program to find POS tags of words in a sentence using Viterbi decoding.
8. Program to know the importance of context and size of training corpus in learning Parts of Speech.
9. Program to understand the concept of chunking and get familiar with the basic chunk tagset .
10. Program to know the importance of selecting proper features for training a model and size of training corpus in learning how to do chunking.

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| COURSE CODE | CATEGORY | COURSE NAME | L | T | P | CREDITS | TEACHING & EVALUATION SCHEME | | | | |
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| | | | | | | | THEORY | | PRACTICAL | | |
| | | | | | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* |
| **MTCS124** | | **Multimedia Computing** | 2 | - | 2 | 3 | 60 | 20 | 20 | 30 | 20 |

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

## Course Objectives

1. To provide the foundation knowledge of multimedia computing, e.g. media characteristics, compression standards, multimedia representation, data formats, multimedia technology development.

## Course Educational Objectives (CEOs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.
The students will be able to

1. Understand the characteristics of different media; understand the representations of different multimedia data; understand different data formats; be able to take into considerations in multimedia system designs.
2. Understand the characteristic of human's visual system; understand the characteristic of human's audio system; be able to take into considerations in multimedia techniques design and implementation.
3. Understand different compression principles; understand different compression techniques; understand different multimedia compression standards; be able to design and develop multimedia systems according to the requirements of multimedia applications.
4. Program multimedia data and be able to design and implement media applications.

# Syllabus

**UNIT I** **10HRS**

Define Multimedia Signal, Elements Of Multimedia Communication Systems, Challenges Involved With Multimedia Communication, Types Of Multimedia (Image, Text, Audio, Video ).

**UNIT II** **9HRS**

Fundamentals of Image, Redundancy In Image, Lossless And Lossy Image Compression Techniques, Measurements Quality of Reconstructed Image (MSE, SNR, PSNR) .

**UNIT III** **8HRS**

Audio Compression, PCM, DPCM, ADPCM, Adaptive Predictive Coding, Linear Predictive Coding, Code-Excited Coding, Perceptual Coding, Mpeg Audio Coder, Digital Video Coding Fundamentals.

**UNIT IV** **7HRS**

VEDIO Compression Principles, Video Compression Standards. Types of video signals, Analog video, Digital video, Basic Video compression techniques: H.261, H.263, MPEG1, MPEG2, MPEG4, MPEG7.

**UNIT V** **8HRS**

Components of multimedia, Fundamentals of Information theory, Multimedia Authoring tools, Basics of Data Compression: - Run-length, Huffman, Arithmetic, Dictionary based data compression. Issues of Multimedia communication , Data Transmission, Multimedia over IP and ATM network, Transportation of MPEG4, Media-on- Demand, Multimedia over Wireless Network.

**References:**

1. Multimedia Computing by Gerald Friedland and Ramesh Jain
2. Multimedia Information Systems, Kluwer International Series in Engineering and Computer Science
3. Multimedia Systems and Applications. By: Angelides, Marios C.; Dustdar, Schahram. Published by: Springer Science & Business Media. ISBN: 0792399153

**Practical's List:**

1. Introduction to Matlab and the user interface
2. Programming using Matlab
3. Basic operations in Matlab.
4. Functions in Matlab.
5. Image processing using Matlab.
6. Compression algorithms design and implementation.
7. Image/video compression and decompression

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**SEMESTER-I**

| COURSE CODE | CATEGORY | COURSE NAME | L | T | P | CREDITS | TEACHING & EVALUATION SCHEME | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | THEORY | | PRACTICAL | | |
| | | | | | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* |
| **MTCS106** | | **Design Pattern Lab** | - | - | 2 | 1 | - | - | - | - | 50 |

**Legends**: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives (CEOs):

To strengthen the knowledge of Object Oriented Design and Development by understanding various design patterns.

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### Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.
The students will be able to
1. Understand common design patterns in the context of incremental/iterative development.
2. Evaluate and retractor software source code using patterns.
3. Analyze and combine design patterns to work together in software design.
4. Implement the design patterns in an object oriented language.
5. Understand the benefits of a pattern approach over program in a software application.

## Syllabus

**UNIT I** **10HRS**

Introduction to Software Patterns, Overview of UML, Class Diagrams, Collaboration Diagrams, State chart Diagram, Deployment Diagram, Fundamental Design Patterns: Delegation, Interface, Abstract Super-class, Interface and Abstract class, Immutable, Marker Interface

**UNIT II** **9HRS**

Creational Patterns:

Simple Factory pattern, Factory Method, Abstract Factory, Builder, Prototype, Singleton

**UNIT III** **8HRS**

Structural Patterns:

Adaptor, Bridge, Composite, Façade, Flyweight, Decorator, Proxy Pattern

**UNIT IV** **7HRS**

Behavioural Patterns:

Chain of Responsibility, Command, Interpreter, Mediator, Memento Pattern

**UNIT V** **8HRS**

Observer, State, Strategy, Template Method, Visitor, Iterator Pattern

**Text Books:**

1. Gamma, Helm, Johnson, Vlissides, Design Patterns. Elements of Reusable Software., Pearson Education 2006
2. Cooper, J. W., Java Design Patterns, A Tutorial, Pearson Education, 2000.
3. Freeman, Freeman, Head First Design Patterns, O'Reilly Pub. 2007
4. Mark Grand, Patterns in Java Vol. 1, Wiley 2002
5. Mark Grand, Patterns in Java Vol. 2, Wiley 2002
6. Mark Grand, Patterns in Java Vol. 3, Wiley 2002
7. Douglas Schmidt, Pattern Oriented Software Architecture Vol1, John Wiley 2000, also called as POSA

**Practical's List:**

Implementation the following kinds of designs patterns in java with suitable example and also draw the UML Diagrams.

1. Abstract factory design pattern
2. Adapter-class Design pattern
3. Adapter-object Design pattern
4. Strategy Design pattern
5. Builder Design pattern
6. Bridge Design pattern
7. Decorator Design pattern
8. Flyweight Design pattern
9. Facade Design pattern
10. Facade Design pattern
11. Iterator Design pattern
12. Mediator Design pattern
13. Proxy Design pattern
14. Visitor Design pattern