JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

COURSE STRUCTURE AND SYLLABUS

For UG – R20

B. Tech - COMPUTER SCIENCE AND DESIGN

(Applicable for batches admitted from 2020-2021)

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II Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	BS2101	Mathematics - III	3	0	0	3
2	CS2101	Mathematical Foundations of Computer Science	3	0	0	3
3	CS2102	Computer Graphics	3	0	0	3
4	CS2103	Multimedia and Application Development	3	0	0	3
5	CS2104	Database Management Systems	3	0	0	3
6	CS2105	Computer Graphics Lab	0	0	3	1.5
7	CS2106	Multimedia and Application Development Lab	0	0	3	1.5
8	CS2107	Database Management Systems Lab	0	0	3	1.5
9	SO2101	Mobile App Development	0	0	4	2
10	MC2101	Essence of Indian Tradition Knowledge	2	0	0	0
		Total Credits	17	0	13	21.5

II Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	BS2201	Probability and Statistics	3	0	0	3
2	CS2201	Computer Organization	3	0	0	3
3	CS2202	Data warehousing and Mining	3	0	0	3
4	ES2201	Visual Design and Communication	3	0	0	3
5	HS2201	Managerial Economics and Financial Accountancy	3	0	0	3
6	CS2203	Games Development Lab	0	0	3	1.5
7	CS2204	Data Mining using Python Lab	0	0	3	1.5
8	ES2202	Web Application Development Lab	0	0	3	1.5
9	SO2201	Digital Photography using Adobe Photoshop	0	0	4	2
		Total Credits	15	0	13	21.5

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II Year – II Semester		L	T	P	C
		3	0	0	3
PROBABILITY AND STATISTICS (BS2201)					

Course Objectives:
- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:
Upon successful completion of this course, the student should be able to
- Classify the concepts of data science and its importance
- Interpret the association of characteristics and through correlation and regression tools
- Make use of the concepts of probability and their applications
- Apply discrete and continuous probability distributions
- Design the components of a classical hypothesis test
- Infer the statistical inferential methods based on small and large sampling tests

UNIT I
Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNIT II
Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Method of least squares – Straight line – parabola – Exponential – Power curves.

UNIT III
Probability and Distributions: Probability– Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT IV
Sampling Theory: Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT V
Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Text Books:
1. Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

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Reference Books:
1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
3) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

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II Year – II Semester		L	T	P	C
		3	0	0	3
	COMPUTER ORGANIZATION (CS2201)				

Course Objectives:
The course objectives of Computer Organization are to discuss and make student familiar with
- Principles and the Implementation of Computer Arithmetic
- Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
- Fundamentals of different Instruction Set Architectures and their relationship to theCPU Design
- Memory System and I/O Organization
- Principles of Operation of Multiprocessor Systems and Pipelining

Course Outcomes:
By the end of the course, the student will
- Develop a detailed understanding of computer systems
- Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
- Develop a detailed understanding of architecture and functionality of central processing unit
- Exemplify in a better way the I/O and memory organization
- Illustrate concepts of parallel processing, pipelining and inter processor communication

UNIT I
Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, BusStructures, Data Representation: Data types, Complements, Fixed Point Representation. FloatingPoint Representation. Other Binary Codes, Error Detection Codes.
Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT II
Register Transfer Language and Microoperations: Register Transfer language. Register TransferBus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift MicroOperations, Arithmetic Logic Shift Unit.
Basic Computer Organization and Design: Instruction Codes, Computer Register, ComputerInstructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt,Complete Computer Description.

UNIT III
Central Processing Unit: General Register Organization, STACK Organization. InstructionFormats, Addressing Modes, Data Transfer and Manipulation, Program Control, ReducedInstruction Set Computer.
Microprogrammed Control: Control Memory, Address Sequencing, Micro Program example,Design of Control Unit.

UNIT IV
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, AssociativeMemory, Cache Memory, Virtual Memory.
Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous datatransfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

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UNIT V

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures,Inter Processor Arbitration.

Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:
1. Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.
2. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5/e, McGrawHill, 2002.

Reference Books:
1. Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.
2. Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
3. Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer,2006.

Web Resources:
1. https://nptel.ac.in/courses/106/105/106105163/
2. http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf

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II Year – II Semester		L	T	P	C
		3	0	0	3
	DATA WAREHOUSING AND MINING(CS2202)				

Course Objectives:
- To understand and implement classical models and algorithms in data warehousing and data mining.
- To analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- To assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

Course Outcomes:
Upon successful completion of the course, the student will be able to:
- Summarize the architecture of data warehouse
- Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data.
- Construct a decision tree and resolve the problem of model overfitting
- Compare Apriori and FP-growth association rule mining algorithms for frequent itemset generation
- Apply suitable clustering algorithm for the given data set

UNIT- I
Data Warehouse and OLAP Technology: An Overview: What Is a Data Warehouse? A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining. (Han &Kamber)

UNIT- II
Data Mining: Introduction, What is Data Mining?, Motivating challenges, The origins of Data Mining, Data Mining Tasks, Types of Data, Data Quality.
Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature creation, Discretization and Binarization, Variable Transformation, Measures of Similarity and Dissimilarity. (Tan &Vipin)

UNIT -III
Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.
Model Overfitting: Due to presence of noise, due to lack of representation samples, evaluating the performance of classifier: holdout method, random sub sampling, cross-validation, bootstrap. Bayes Theorem, Naïve Bayes Classifier (Tan &Vipin)

UNIT -IV
Association Analysis: Basic Concepts and Algorithms: Problem Definition, Frequent Item Set Generation, Apriori Principle, Apriori Algorithm, Rule Generation, Compact Representation of Frequent Itemsets, FP-Growth Algorithm. (Tan &Vipin)

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UNIT -V
Cluster Analysis: Basic Concepts and Algorithms: Overview, What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Tan &Vipin)

Text Books:
1. Introduction to Data Mining : Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.
2. Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier, 2011

Reference Books:
1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning, 2010
2. Data Mining : Introductory and Advanced topics : Dunham, First Edition, Pearson, 2020
3. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH, 2008
4. Data Mining Techniques, Arun K Pujari, Universities Press, 2001

Web Resources:
1. NPTEL Online Course on Data Mining : https://onlinecourses.nptel.ac.in/noc18_cs14/preview

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II Year – II Semester		L	T	P	C
		3	0	0	3
VISUAL DESIGN AND COMMUNICATION (ES2201)					

Course Outcomes:
- Students will develop the ability to create visual compositions using basic elements and apply appropriate principles of visual composition to communicate ideas.
- Students will begin to understand the visual language and develop the ability to perceive, visualize and communicate using visual narratives.
- Students will develop the ability to apply the visual dynamics of visual language in Typography, Photography and Videography.
- Students will begin to understand the visual dynamics that exists in visual design as a visualisation process to evolve mental imageries that represent solutions to simple communication problems.
- Students will be able to execute design solutions using appropriate software programmes.

UNIT-I
INTRODUCTION TO VISUAL DESIGN: The importance of understanding visual language and its relation in context to nature and environment
ELEMENTS OF VISUAL LANGUAGE: Exploring and understanding Dots, Lines, Forms, Space, Pattern, Texture and Colouras an elements of visual language.

UNIT-II
INTRODUCTION TO THE PRINCIPLES OF VISUAL LANGUAGE: Visual explorations and experiments with Form, Colour, and Space, Texture, in relation to the context and environments – Concepts of harmony, balance, contrast, proportion, order, symmetry, asymmetry, rhythm, tension, juxtaposition, proximity, size, scale, proportion, orientation, alignment, variety, gradation, dominance, subordination, transition etc.

UNIT-III
INTRODUCTION TO FUNDAMENTALS OF TYPOGRAPHY: Introduces Typography as a means of Communication and engages in typographical explorations to understand the technicalities, nuances and aesthetics of types.Study of visual principles of text and image composition : Layouts, Grids, Content Development and Information Hierarchy.
Application of Typography, Image and layouts in the design of signage systems, identity systems, social communications,

UNIT-IV
INTRODUCTION TO PHOTOGRAPHY: Study of photography as a medium to document, communicate and create photographic imagery. Exploring photo story as a narrative medium.
INTRODUCTION TO VIDEOGRAPY: Study of videography as a medium to document, communicate and create a short 2 minute video.

UNIT-V
COMMUNICATION THEORIES, SEMIOTICS AND VISUAL PERCEPTION: Understand the process of communication and the theories that make a difference to the development of a visual language.

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STORY TELLING, NARRATIVES AND ITS ROLE IN DESIGN: Understand story telling and narratives as effective methods to scope problems and problem solving processes.

Text Books:
1. Wallschlaeger, Charles, &Busic-Synder, Cynthia, Basic Visual Concepts and Principles for Artists, Architects and Designers, McGraw-Hill, 1992.

Reference Books:
1. Buxton, Bill, Sketching User Experience: Getting the Design Right and the Right Design (Interactive Technologies), Morgan Kaufmann, 2007.
2. Caplin, Steve; Banks, Adam,The Complete Guide to Digital Illustration, Publisher: Watson - Guptill Publications, 2003
3. Demers, Owen,Digital Texturing & Painting, Publisher: New Riders Press; Bk&CD-ROM Edition,2001.
4. Cairo, Alberto,The Functional Art. New Riders, 2013.

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II Year – II Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY(HS2201)					

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement-Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

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UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:
1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:
1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.
2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.
4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

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II Year – II Semester		L	T	P	C
		0	0	3	1.5

GAMES DEVELOPMENT LAB (CS2203)

Course Outcomes:
At the end of the course, students will be able to
- Learning how to use the various fundamentals of Unity
- Understanding how everything works in the engine
- Understanding the basic concepts of game design
- Creating and building actual sample games
- Learning how to deploy your projects to the market

Software Requirement:
Unity Game Engine

List of Experiments:
1. Unity Installation and Setup
2. Creating and Modifying Sprites
3. Transforms and Object Parenting
4. Creation of Internal assets
5. Saving and Loading Scenes
6. Basic Movement Scripting
7. Understanding Collisions, Rigid bodies
8. Custom Collision Boundaries
9. Understanding Prefabs and Instantiation
10. Game Object Destruction
11. Starting with UI
12. The Button and Text Element, slider
13. Materials and Shaders
14. The Particle System
15. Using the Asset Store

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II Year – II Semester		L	T	P	C
		0	0	3	1.5

DATA MINING USING PYTHON LAB (CS2204)

Course Objectives:
- Practical exposure on implementation of well-known data mining algorithms
- Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting.

Course Outcomes:
Upon successful completion of the course, the student will be able to:
- Apply preprocessing techniques on real world datasets
- Apply apriori algorithm to generate frequent itemsets.
- Apply Classification and clustering algorithms on different datasets.

Note: Use python library scikit-learn wherever necessary

1. Demonstrate the following data preprocessing tasks using python libraries.
    a) Loading the dataset
    b) Identifying the dependent and independent variables
    c) Dealing with missing data

2. Demonstrate the following data preprocessing tasks using python libraries.
    a) Dealing with categorical data
    b) Scaling the features
    c) Splitting dataset into Training and Testing Sets

3. Demonstrate the following Similarity and Dissimilarity Measures using python
    a) Pearson's Correlation
    b) Cosine Similarity
    c) Jaccard Similarity
    d) Euclidean Distance
    e) Manhattan Distance
4. Build a model using linear regression algorithm on any dataset.
5. Build a classification model using Decision Tree algorithm on iris dataset
6. Apply Naïve Bayes Classification algorithm on any dataset
7. Generate frequent itemsets using Apriori Algorithm in python and also generate association rules for any market basket data.
8. Apply K- Means clustering algorithm on any dataset.
9. Apply Hierarchical Clustering algorithm on any dataset.
10. Apply DBSCAN clustering algorithm on any dataset.

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Web Resources:

1. https://analyticsindiamag.com/data-pre-processing-in-python/
2. https://towardsdatascience.com/decision-tree-in-python-b433ae57fb93
3. https://towardsdatascience.com/calculate-similarity-the-most-relevant-metrics-in-a-nutshell-9a43564f533e
4. https://www.springboard.com/blog/data-mining-python-tutorial/
5. https://medium.com/analytics-vidhya/association-analysis-in-python-2b955d0180c
6. https://www.datacamp.com/community/tutorials/naive-bayes-scikit-learn
7. https://www.analyticsvidhya.com/blog/2019/05/beginners-guide-hierarchical-clustering/
8. https://towardsdatascience.com/dbscan-algorithm-complete-guide-and-application-with-python-scikit-learn-d690cbae4c5d

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		L	**T**	**P**	**C**
II Year – II Semester		**0**	**0**	**3**	**1.5**
WEB APPLICATION DEVELOPMENT LAB (ES2202)					

Course Objectives:
- To develop the skill in Creating dynamic web pages with servlets
- To provide knowledge in connecting java programs with database using JDBC.
- To develop the skill in server side programming using JSP, node.js, React.js
- To provide knowledge about MERN stack
- Testing the application on an Application Server.
- Debugging Web applications locally and remotely

Course Outcomes:
By the end of the course, the student will be able to
- Develop Single Page Applications
- Develop NodeJS&ReactJS Reusable Service
- Store the data in MySQL
- Get acquainted with the latest web application development trends in the IT industry

List of Experiments:
1. Authentication using Java Servlet
2. Authentication using JSP
3. Connect MySQL database using JSP
4. Design and development of Online Book Shop using JSP/Node.js & React.js
5. Design and development of Online Examination using JSP/Node.js & React.js
6. Design and development of online ticket reservation system using JSP/Node.js & React.js
7. Design and development of online library using JSP/Node.js & React.js
8. Design and development of online banking using JSP/Node.js & React.js
9. Design and development of online job portal using JSP/Node.js & React.js
10. Design and development of Online Auction using JSP/Node.js & React.js

Note: Students are encouraged to propose innovative ideas in the field of E-commerce as projects.

References:
1. Jason Hunter, William Crawford , Java Servlet Programming, Second Edition, ,O'Reilly Media
2. Hans Bergsten, Java Server Pages, O'Reilly
3. http://www.oracle.com/technetwork/java/index-jsp-135475.html
4. http://www.oracle.com/technetwork/java/javaee/jsp/index.html

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II Year - II Semester	Skill Oriented Course- II	L	T	P	C
		0	0	4	2
	DIGITAL PHOTOGRAPHY USING ADOBE PHOTOSHOP (SO2201)				

Software Requirement:
Adobe Photoshop

List of Experiments:
1. Installation of Photoshop
2. Photoshop Workspace and Shortcut Keys
3. Layers in Photoshop
4. Demonstrate how to Remove Background of an Image Using Photoshop.
5. Photoshop Brush Tool and Pen Tool
6. Demonstrate how to change color in photoshop.
7. Demonstrate how to Resize a layer in Photoshop.
8. Demonstrate how to Add Fonts in Photoshop.
9. Demonstrate how to Crop an Image in Photoshop.
10. Demonstrate how to Curve Text in Photoshop.
11. Demonstrate how to Flip an Image in Photoshop.
12. Demonstrate how to Smooth Edges in Photoshop.