Shri Vaishnav Vidyapeeth Vishwavidyalaya
Master of Technology (Computer Science Engineering)

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*
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 Objectives:

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:

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

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

UNIT II

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

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

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

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**	2	-	2	3	60	20	20	30	20

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Course Objectives:
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:
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.

UNIT I
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
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
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

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

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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MTCS103		**Advance Computer Network**	2	-	2	3	60	20	20	30	20

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Course Objectives:

1. To be able to demonstrate an understanding of the physical properties and performance characteristics of communication media; specifically copper cable, fibre optics and wireless networks
2. To be able to demonstrate an understanding of the importance of communication standards, including an appreciation of protocol layer models and enhancements to those standards
3. To be able to demonstrate an appreciation of the theory and practice of common local area networks including virtual and wireless LANs.
4. To be able to demonstrate an appreciation of the theory and practice of wide area networks and their interconnection
5. To be able to demonstrate an appreciation of the significance of network and inter-network protocols; specifically IPv4, IPv6, TCP and UDP
6. To be able to describe the importance of reliability and quality of service, including examples of error recovery strategies, traffic differentiation and prioritization

Course Outcomes:

After successful completion of the course students should be able to:

1. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies;
2. Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols;
3. Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure
4. Have a working knowledge of datagram and internet socket programming

UNIT I

Introduction Concepts: Goals and Applications of Networks, Requirements , Network architecture , Networking principles, Network services and Layered architecture .The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling

UNIT II

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling Protocol architecture - Protocols - OSI - TCP/IP - LAN architecture - Topologies - MAC - Ethernet, Fast Ethernet, Token ring, Wireless LANS ,Switches.

UNIT III

Circuit switching vs. packet switching / Packet switched networks – IP – ARP – RARP – DHCP – ICMP – Queueing discipline – Routing algorithms – RIP – OSPF – Subnetting – CIDR – Interdomain routing – BGP – Ipv6 – Multicasting – Congestion avoidance in network layer

UNIT IV

Transport Layer - Design issues, connection management, session Layer Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management UDP – TCP – Adaptive Flow Control – Adaptive Retransmission - Congestion control – Congestion avoidance – QoS.). Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks

UNIT V

Email (SMTP, MIME, IMAP, POP3) – HTTP – DNS- SNMP – Telnet – FTP – Security – PGP – SSH. Control of networks: objectives and methods of control, Circuit switched networks, datagram and ATM networks. Mathematical background for control of networks like Circuit switched networks, Datagram and ATM networks Wireless LAN, 802.11, DHCP, outing in the Internet, MOSTF DVMRP, IP Over ATM, Storage Area Networks, Traffic Engineering Planning, WAP, Tiny OS, NEST Cellular Network, Multimedia Over Internet, RTP, RSVP, Tuning RED for Web Traffic, XCP, Skype, Internet Telephony, Enterprise Network Security, SNAT, DNAT.

Reference Books:

1. Computer Networking- A Top-Down approach, 5th edition, Kurose and Ross, Pearson
2. Computer Networks- A Top-Down approach, Behrouz Forouzan, McGraw Hill
3. Computer Networks (4th edition), Andrew Tanenbaum, Prentice Hall
4. Computer Networking and the Internet (5th edition),Fred Halsall, Addison Wesley
5. Data Communications and Networking (4th edition), Behrouz Forouzan, McGraw Hill
6. TCP/IP Protocol Suite (3rd edition), Behrouz Forouzan, McGraw Hill

Practical's List:

1. Simulate cyclic redundancy check (crc) error detection algorithm (crc) for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm.
6. Simulate and implement dijkestra algorithm for shortest path routing.
7. Programs for ip address conversion function
8. Client server applications using inter process communication and synchronous
    a. Mechanisms fifo, Message queues, Shared memory
9. Connection oriented client server applications with tcp
10. Connectionless client server applications with UDP
11. Programs using rpc remote procedure call
12. Client server applications using concurrent server
13. Client server applications using multi protocol server.

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MTCS111		**Data Mining & Warehousing**	2	-	2	3	60	20	20	-	50

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Course Objective:
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 Outcome:
Student 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.

UNIT I
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
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
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
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

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 Objectives
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 Outcome:
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.

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

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

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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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Course Objectives:
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:
At the end of the course the student 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

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

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

UNIT IV
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

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UNIT V

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		**Big Data Analysis**	2	-	2	3	60	20	20	-	50

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Course Objectives
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:
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.

UNIT I
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
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
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

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

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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							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 Objectives:

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:

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.

UNIT I

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

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

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

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

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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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTCS122		**Cloud Computing**	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 Objectives

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:

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.

UNIT I

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

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

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

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

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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							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 Objectives:

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:
Students, completing subject, will have demonstrated an ability 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
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
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

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

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

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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							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

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

Course Outcomes:
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.

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

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

UNIT III
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
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
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

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	E D	TEACHING & EVALUATION SCHEME	
							THEORY	PRACTICAL

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							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 Objective:
To strengthen the knowledge of Object Oriented Design and Development by understanding various design patterns.
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Course Outcomes:
At the end of the course the student 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.

UNIT I
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

Creational Patterns:

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

UNIT III

Structural Patterns:

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

UNIT IV

Behavioural Patterns:

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

UNIT V
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

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTCS107		**MATLAB Lab**	-	-	2	1	-	-	-	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 Objectives:
1. To cover the basic theory and algorithms that are widely used in digital image processing.
2. To expose students to current technologies and issues that are specific to image processing systems
3. To develop skills in using computers to process images.

UNIT I
Introduction: MATLAB basics, The MATLAB environment, Basic computer programming Variables and constants, operators and simple calculations Formulas and functions, MATLAB toolboxes

UNIT II
Matrices and vectors, Matrix and linear algebra review, Vectors and matrices in MATLAB , Matrix operations and functions in MATLAB.

UNIT III
Computer programming Algorithms and structures, MATLAB scripts and functions (m-files), Simple sequential algorithms Control structures (if...then, loops).

UNIT IV
MATLAB programming, Reading and writing data, file handling , Personalized functions, Toolbox structure MATLAB graphic functions.

UNIT V
Numerical simulations, Numerical methods and simulations, Random number generation, Montecarlo methods

References:

1. Textbook: Insight Through Computing: A Matlab Introduction to Computational Science and Engineering by C. F. Van Loan and K.-Y. D. Fan. SIAM Publication, 2009, ISBN: 978-0-898716-91-7.

2. David Kuncicky, MatLAB Programming, Prentice Hall; 1st edition, 2003, ISBN 013035127X.

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Practical's List :

1. Practicing MATLAB environment with simple exercises to familiarize Command Window, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts, Help files.
2. Data types, Constants and Variables, Character constants, operators, Assignment statements.
3. Control Structures: For loops, While, If control structures, Switch, Break, Continue statements.
4. Control Structures: For loops, While, If control structures, Switch, Break, Continue statements.
5. Input-Output functions, Reading and Storing Data.
6. Vectors and Matrices, commands to operate on vectors and matrices, matrix Manipulations.
7. Arithmetic operations on Matrices, Relational operations on Matrices, Logical operations on Matrices.
8. Polynomial Evaluation, Roots of Polynomial, Arithmetic operations on Polynomials.
9. Graphics: 2D plots, Printing labels, Grid & Axes box, Text in plot, Bar and Pie chart.

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