GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 4th Semester
Subject Name: Computer Networking (CN)
Subject Code: 4649301

With effective from academic year 2018-19

1. **Learning Objectives:**

- To equip the students with basics concept of Computer Networks.
- To familiarize the students with the standard models for the layered approach OSI and TCP/IP to communication between machines in a network and the protocols of the various layers.
- To gain basic insight of programming for network solutions.

2. **Prerequisites:** Basic Concept of Data Structures, Operating systems, Programming Language and Knowledge of Linux OS.

3. **Course Contents:**

Unit	Course Content	Weightage Percentage
Unit I	**Introduction:** Personal Area Network, Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks, Network software, protocol hierarchies, Design issues for the layers, connection oriented vs. Connectionless service, service primitives, relationship of services in protocols, Reference Models, Open System Interconnection (OSI), TCP/IP Reference models, Example Networks: ARPANET, NSFNET, Architecture of Internet.	**15%**
Unit II	**Physical Layer:** Guided Transmission Media, Magnetic Media, Twisted Pairs, Coaxial Cable, Power Lines, Fiber Optics, Wireless Transmission, Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared Transmission, Light Transmission, Digital Modulation and Multiplexing, Public Switched Telephone Networks.	**15%**
Unit III	**Data Link Layer:** Design issues, Error detection and correction. Elementary data link protocols: Utopian simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols, Example data link protocols.	**15%**
Unit IV	**Medium Access Control Sublayer:** The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, IEEE 802.11 Architecture and Protocol Stack, Physical layer, sublayer, Frame Structure, Services, Data link layer switching.	**15%**
Unit V	**Network Layer:** Design issues, Routing algorithms: Optimality principle, shortest path routing, Flooding, distance vector routing,Link State routing, Congestion Control Algorithms, The Network layer in the Internet.	**15%**
Unit VI	**Transport Layer:** Transport Services, Elements of Transport protocols, Connection establishment, connection release, Error control, flow control, congestion control, UDP and TCP protocols.	**15%**
Unit VII	**Application Layer:** Domain name system, Electronic Mail; the World Wide Web, HTTP	**10%**

4. Text Book:

1) Andrew S Tanenbaum, David. J. Wetherall, "Computer Networks", Pearson Education, 5th Edition,

5. Reference Books:

1) Bhushan H Trivedi ,"Computer Networks", Oxford University Press
2) Behrouz A. Forouzan, "Data Communications and Networking", Tata McGraw-Hill, Fourth Edition
3) Kurose and Ross,Computer Networking- A Top-Down approach, Pearson, 5th edition
4) Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann Publishers, Fifth Edition, 2011.
5) Fred Halsall,Computer Networking and the Internet, Addison Wesley, (5th edition)
6) Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher, 2011

6. Chapter wise Coverage from the Text Book:

Unit #	Chapter
I	Chapter 1: 2,3,4.1 to 4.4,5.1
II	Chapter 2: 2,3,5,6
III	Chapter 3: 1,2,3,4,5
IV	Chapter 4: 1,2,3.1 to 3.7,4,5,6
V	Chapter 5: 1,2.1 to 2.5,3,6.1 to 6.4
VI	Chapter 6: 1.1,1.2, 2.1 to 2.4, 3.1 to 3.2, 4.1, 4.2,5.1 to 5.9
VII	Chapter 7: 1,2,3.1, 3.4

Students are not required to reproduce the entire algorithms/protocol code in the theory exam for any protocols and routing algorithms. Concepts based on these algorithms/ protocols should be asked in theory exam.

- **7. Accomplishment of the student after completing the course**:

At the end of the course, the student should be able to:
1) Understand concepts of networking and gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
2) Identify the components required to build different types of networks
3) Obtain the skills of sub netting and routing mechanisms.
4) Have a working knowledge of datagram
5) Trace the flow of information from one node to another node in the network

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Practical List

1. Download Wireshark from its official webpage, It is a network packet analyzer
   https://www.wireshark.org/
2. Install Wireshark under Windows/Linux/MAC/Solaris platform, Windows installer
   names contain the platform and version. Install WinPcap

Lab1:
Objective: To make the students aware about the IT/Network infrastructure of their parent institute.

Introduction to the lab infrastructure, the cabling/cable type and specifications/switch/topology/router/network infrastructure, Internet Connectivity, Wi-fi Connectivity of your department (labs and lecture halls) and how it is connected with the overall institute level IT infrastructure, How the institute obtains Internet Connectivity from its ISP, The Bandwidth and other specifications, Visit to the Computer Center of the Institute, Introduction to various Enterprise Servers/Servers of Licensed Software, Server hardware configuration, Server Management Tools, Enterprise Level Firewall, etc. So, lab 1 is intended as an in-campus IT infrastructure industrial visit for students. Students are supposed to prepare a report of this visit. Students are also supposed to note down the model/make of various network interface devices (NIC card, switch, router) used in their lab/department/institute, download their technical specifications from their respective web-site and attach those specifications in the report. The significance and interpretation of these specifications may be discussed by the faculty member during the corresponding lab/lecture hours pertaining to that particular device.

Lab 2:
Objective: To make the students aware about and learn the detailed use of the following OS level TCP/IP diagnostic and troubleshooting commands: ping, ns lookup

Lab 3:
Objective: To make the students aware about and learn the detailed use of the following OS level TCP/IP diagnostic and troubleshooting commands: ipconfig, arp, netstat, tracert, telnet

Lab 4a:
Objective: Implement a simple TCP socket based client server program in Python in which the client connects to the server. The server displays the ip address and port number of client and sends an acknowledgement message back to client. The client displays the received acknowledgement message on screen.

Lab 4b:
Objective: Implement a simple UDP socket based client server program in Python in which the client connects to the server. The server displays the ip address and port number of client and sends an acknowledgement message back to client. The client displays the received acknowledgement message on screen.

Lab 5:
Objective: Wireshark Installation, understanding the Wireshark Environment / Menu System, to start and stop live capture of traffic from given wired ethernet network interface, capturing

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options, store captured data in different supported file formats, to open already stored captured data file.

Lab 6:
Objective: Learn and use view level filters and capture level filters in Wireshark for different traffic types like Ethernet, ARP, IP, TCP, UDP, DNS, HTTP, etc. For each captured category, observe how different headers are encapsulated within each other. Eg. TCP encapsulated within IP, HTTP encapsulated within TCP, etc.

Lab 7:
Objective: Capture the following traffic types and Interpret/ Analyze the corresponding header and payload: Ethernet and ARP

Lab 8:
Objective: Capture the following traffic types and Interpret/ Analyze the corresponding header and payload: IP and ICMP

Lab 9:
Objective: Capture the following traffic types and Interpret/ Analyze the corresponding header and payload: TCP and UDP

Lab 10:
Objective: Capture the following traffic types and Interpret/ Analyze the corresponding header and payload: HTTP and DNS

Lab 11:
Objective: Capture the following traffic types and Interpret/ Analyze the corresponding header and payload: FTP, SMTP and Telnet

Lab 12:
Objective: Capture the following traffic types and Interpret/ Analyze the corresponding header and payload: Ethernet and ARP

Lab 13:
Objective: Capture Wi-FI and Bluetooth Traffic and Interpret/ Analyze the corresponding header and payload using Wireless Traffic Sniffing tools like WireShark-USB/AirCrack-ng/Kismet, etc.

Lab 14:
Objective: Analyze Email Traffic: Normal POP Communications, POP Problems, Dissect the POP Packet Structure, Filter on POP Traffic, Normal SMTP Communications, SMTP Problems, Dissect the SMTP Packet Structure, Filter on SMTP Traffic

Lab 15:
Objective: Analyze IEEE 802.11 (WLAN): Wireless LANs (WLANs) Traffic, Signal Strength and Interference, Capture WLAN Traffic, 802.11 Traffic Basics like Data Frame, Normal 802.11 Communications

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The Practical Examination Exercises would be based on Lab Exercises based on above list EXCEPT Lab # 1, 4a, 4b, 13 and 15. For Lab # 1, 4a, 4b, 13 and 15, documentation/report/file should be maintained.

References:

1) https://technet.microsoft.com/en-us/library/bb727023.aspx
2) https://docs.python.org/2/howto/sockets.html
3) https://www.aircrack-ng.org/
4) https://www.kismetwireless.net/

Note: Some of the practicals form the above practical list may have seemingly similar definitions. For better learning and good practice, it is advised that students do maximum number of practicals. In the practical examination, the definition asked need not have the same wordings as given in the practical list. However, the definitions asked in the exams will be similar to the ones given in the practical list.

Additional Indicative List of Python Programs: (Desirable/for further Exploration)

1. Implement a Python Program to print host name and IP address of local host.
2. Implement a Python Program to print host name and IP address of remote host where IP address of remote host is available.
3. Implement a Python Program to print host name and IP address of remote host where hostname of remote host is available.
4. Implement a TCP port scanner program in python for local host.
   (Note: Do not try this program for a remote host, especially outside your domain. It could cause legal
   problems)
5. Implement a UDP port scanner program in python for local host.
   (Note: Do not try this program for a remote host, especially outside your domain. It could cause
   Legal problems)
6. Implement a TCP based client server program in python using TCP sockets where Server displays the following: a) Host Name, IP address and Port Number on which it is hosted b) IP address and port number of a client requesting connection. Server sends the message "Thanks for Connecting!" back to client. Client displays this message on screen.
7. Implement a UDP based client server program in python using UDP sockets where Server displays the following: a) Host Name, IP address and Port Number on which it is hosted b) IP address and port number of a client sending some dummy message. Server displays the dummy message on screen. Server sends the message "Thanks for Message!" back to client. Client displays this message on screen.
8. Implement a TCP based echo client server program in python.
9. Implement a UDP based echo client server program in python.
10. Implement a TCP based daytime client server program in python.
11. Implement a UDP based daytime client server program in python.
12. Implement a TCP based client server text chat program in python.
13. Implement a UDP based client server text chat program in python.
14. Implement a TCP based echo client server program in python with a multi-threaded server.

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15. Implement a TCP based daytime client server program in python with a multi-threaded server.

16. Implement a web client using urllib to:

a) Display the html source of a given URL on screen

b) Display the URL visited

c) Display the header information transmitted in the http response sent by the contacted web-site/web-server.

d) Display the http server status code

17. Implement an ftp client using ftplib which connects to an ftp server, takes login/password from user, displays directory list and permits upload and download of files.

Reference Material for Python Network Programming:

1. Learning Python Network Programming, Dr. M.O. Faruque Sarker & Sam Washington, Packt Publishing, 2015

2. Python Network Programming Cookbook, 2nd Edition, Pradeeban Kathiravelu, Dr. M.O. Faruque Sarker, Packt Publishing, 2017

3. Foundations of Python Network Programming, 3rd edition, Brandon Rhodes & John Goerzen, Apress Publications

4. Beginning Python: From Novice to Professional, 2nd edition, 2009 (Indian Reprint), Apress Publications

5. https://docs.python.org/3/howto/sockets.html

6. https://docs.python.org/3/library/socket.html

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Syllabus for Master of Computer Applications, 4th Semester
Subject Name: Statistical Methods (SM)
Subject Code: 4649302

With effective from academic year 2018-19

1. Learning Objectives:

To understand and apply various concepts, techniques and methods used in Descriptive Statistics and Inferential Statistics. The knowledge and skills gained will equip students in carrying out preliminary Data Analytics tasks, and to prepare foundation to understand and apply the statistical techniques in various fields such as Total Quality Management, Simulation, Game Theory, Operations Research, etc in addition to Computer Science topics such as Machine Learning, Cryptography, Artificial Intelligence, Operating Systems, Data Structures and Algorithms, etc.

2. Prerequisites: Preliminary mathematical concepts

3. Contents:

Unit	Course Content	Weightage Percentage
Unit I	**Introduction to Statistics and Descriptive Statistics** Introduction, Broad areas (classification) of Statistics; **Describing Data Visually:** Frequency Distributions and Histograms; Pie Charts; Bar Charts: Pareto Chart, Scatter Plots (Degree of Association); Line Charts **Descriptive Statistics:** Central Tendency; Mean and its Characteristics, Median and its Characteristics, Quartiles and Percentiles, Mode; **Dispersion:** Range, Mean Absolute Deviation, Interquartile Range (IQR); Variance, Standard Deviation and its Characteristics, Coefficient of Variation; **Standardized Data:** Chebyshev's Theorem, Outliers; **Box Plots:** Fences and Unusual Data Values **Grouped Data:** Nature, Mean and Standard Deviation, Accuracy Issues **Skewness:** Coefficient of Skewness; **Kurtosis**: Leptokurtic, Platykurtic, Mesokurtic; **Measures of Association:** Covariance, Correlation, Coefficient of Correlation; Correlation and Causation	18%
Unit II	**Probability and Probability Distributions** **Introduction:** Common Framework: Experiment, Event, Elementary Events, Sample Space; Definition of Probability; Marginal Probability; Probability of Union of Events (Addition Laws), Probability Matrix; Probability of Complement of a Union; Probability of Joint Events	24%

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	(General Laws of Multiplication); Conditional Probability; Mutually Exclusive Events, Independent Events; Revision of Probabilities: Bayes' Rule **Discrete Probability Distributions:** Introduction, Binomial Distribution, Poisson Distribution, Applications; Overview of other Discrete Probability Distributions **Continuous Probability Distributions:** Introduction, Normal Distribution, Exponential Distribution, Applications; Overview of other Continuous Probability Distributions		
Unit III	**Sampling, Sampling Distributions and Estimation** **Types of Sampling:** Random, Nonrandom; Sampling Distribution of x-bar; Central Limit Theorem; z Formula for Sample Mean; Standard Error of Mean; Sampling from a Finite Population; Sampling Distribution of a Proportion, Standard Error of Proportion **Estimation for Single Population:** Estimating the Population Mean using z Statistic (σ Known); Estimating the Population Mean using the z Statistic when the Sample Size is Small; Estimating the Population Mean using t Statistic (σ Unknown); Estimating the Population Proportion; Estimating the Population Variance; Estimating Sample Size	24%	
Unit IV	**One Sample Hypothesis Tests** Introduction; Null Hypothesis, Alternate Hypothesis; Type I & Type II Errors, Testing Hypotheses about a Population Mean using z Statistic (σ Known); Using Critical Value Method to test Hypotheses, Examples; Population Mean Testing Hypotheses about a Population Mean using t Statistic (σ Unknown); Testing Hypotheses about a Proportion; Testing Hypotheses about a Variance **Overview:** Statistical Inferences about Two Populations; Analysis of Variance	18%	
Unit V	**Regression** Introduction, Simple Regression Analysis, Least Square Analysis to Determine the Equation of Regression Line; Residual Analysis, Using Residual to Test the Assumptions of the Regression Model; Standard Error of the Estimate; Coefficient of Determination; Hypothesis Testing for the Slope of the Regression Model; Testing the Overall Model; Using Regression to Develop a Forecasting Trend Line **Overview:** Multiple Regression Model; Mathematical Transformation of Nonlinear Models	16%	

4. Text Book:

1) Ken Black, "Business Statistics for Contemporary Decision Making", Wiley Student Edition, 2010

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5. Reference Books:

1) David P. Doane, Lori E. Seward, "Applied Statistics in Business and Economics" Tata McGraw-Hill, 2010
2) Anderson, Sweeney, Williams, "Statistics for business and economics", 9th edition,
3) Thompson Publication
4) Bharat Jhunjhunwala, "Business Statistics", first edition, S Chand, 2008
5) Richard Levin, David Rubin, "Statistics for Management", 7th edition, PHI
6) Nabendu Pal, Sahadeb Sarkar, "Statistics-Concepts and Applications", 2nd edition, PHI
7) J. Susan Milton & Jesse Arnold, "Introduction to Probability & Statistics: Principles & Applications for Engineering & Computing Sciences", McGraw-Hill Education
8) S P Gupta, "Statistical Methods", 30th edition, S Chand

6. Chapter wise coverage from the Text Books:

Unit#	Chapter #
I	Chapter 1,2,3
II	Chapter 4,5,6
III	Chapter 7,8
IV	Chapter 9,10,11
V	Chapter 14,15,16

7. Accomplishment of the student after completing the course:
Students will be able to apply various concepts, techniques and methods used in Descriptive Statistics and Inferential Statistics in carrying out preliminary Data Analytics tasks. They will also be able to apply the statistical techniques in various fields such as Total Quality Management, Simulation, Game Theory, Operations Research, etc in addition to Computer Science topics such as Machine Learning, Cryptography, Artificial Intelligence, Operating Systems, Data Structures and Algorithms, etc.

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Practical List

Objectives: To implement statistical concepts using a standard tool, such as R. Such implementation is aimed at improved visualization of theoretical concepts. It is also aimed at laying a foundation for Data Analytics and Data Science

Prerequisites: Logical Thinking and Basic Statistical Concepts

Advice (Note) to Teachers:
The list of exercises given below is an indicative list.

Note: R has many datasets. Get the available datasets through command data(). Use R commands related to Statistics for several datasets for a good practice.

Some exercises have been labeled as "**Mandatory**" while other exercises have been marked as "**Desirable**". It is expected that all the students will do **Mandatory** exercises while bright students will additionally do **Desirable** exercises as well.

List of Computer Lab Exercises
1. Introduction and a quick tour to R and R Studio (to be done in Lab) [09 Hours]
(a) Basic data structures and constructs
(b) Available R Datasets, such as mtcars, faithful, etc
(c) Null, NA, Missing Values
(d) Basic Packages related to Statistics: e. g. stats, stats4, graphics, grDevices, modeest, agricolae, etc.

2. Descriptive Statistics [09 Hours]
(a) Compute Mean, Median, Quartiles, Percentile (use quantile() function), Variance, Standard Deviation, IQR, Minimum & Maximum Values, Summary Statistics & interpretation (**Mandatory**)
(b) Histogram, Scatter Plot, Box Plot, Density Plot of R data sets and interpretation
(**Mandatory**)
(c) Generate Frequency Distribution of data as a data frame (**Mandatory**)
(d) Compute Correlation Coefficient and Covariance (**Mandatory**)

3. Probability and Probability Distributions [09 Hours]
(a) Use pnorm(), pbinom(), ppois(), pexp() functions to compute probabilities (**Mandatory**)
(b) Use dnorm(), dbinom(), dpois(), dexp() functions to compute probability density functions (**Mandatory**)
(c) Use qnorm(), qbinom(), qpois, qexp() functions to get x value corresponding to given probability value (**Mandatory**)
(d) Use different parameter values in 3 (a), and 3 (b) to observe the impact of different parameter values and prepare a note on that.
(**Mandatory**)
(e) Plot above results and interpret (**Desirable**)
(f) Statistical test for normality using shapiro.test() function (**Desirable**)

4. Sampling, Sampling Distribution, Hypothesis Testing [12 Hours]
(a) Random sampling with or without replacement using sample() function (**Mandatory**)

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(b) Generate n random samples (take n = 10, 50, 100, 200, 500, 1000 as an example), create a vector of Sample Means. Draw the Density Plot of Sample Means to visualize Central Limit Theorem   (**Mandatory**)

(c) Take a sample and carry out Hypothesis Testing for the following cases:

(**Mandatory**)

1. Std. Deviation known, Large Sample Size, Sample from Non-Normal Population
2. Std. Deviation known, Small Sample Size, Sample from Normal Population
3. Std. Deviation known, Small Sample Size, Sample from non-Normal Population
4. Std. Deviation not known
5. Hypothesis Test for Variance (Chi-square Test)

5. Regression and Linear Modeling   [06 Hours]
(a) Linear regression: One Independent Variable using lm() function; Interpret the output of Model Analysis, Compute Correlation Coefficient, Interpret results   (**Mandatory**)
(b) Linear regression: Multiple Independent Variables using lm() function; Interpret the output of Model Analysis   (**Mandatory**)

Reference Books:
1. Pierre-Andre Cornillon, Arnaud Guyader, Francois Husson, Nicolas Jegou, Julie Josse, Maela Kloareg, Eric Matzner-Lober, Laurent Rouvière, "R for Statistics", CRC Press, Rs. 525/-.
2. Dr. Mark Gardener, "Beginning R: The Statistical Programming Language", Wiley, Rs. 450/-
3. Paul Teetor, "R Cookbook: Proven Recipes for Data Analysis, Statistics, and Graphics", O'Reilly Cookbooks, Rs. 700/-

Reference Websites:
1. https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf
2. https://cran.r-project.org/web/packages/IPSUR/vignettes/IPSUR.pdf
3. https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/readings/reading-questions-r-intro/
4. https://www.datacamp.com/introduction-to-statistics
5. http://tut-dl.com/item/lynda-r-statistics-essential-training
6. https://www.analyticsvidhya.com › Machine Learning
7. https://www.coursera.org/learn/r-programming
8. https://www.analyticsvidhya.com/blog/2016/02/free-read-books-statistics-mathematics data-science/

Accomplishment of the student after completing the course:
1. Students will be able to carry out preliminary data analysis with results displayed graphically, and study the characteristics of standard probability distributions with their plots.
2. Students will also be able to demonstrate the inductive proof of Central Limit Theorem and go through linear regression (model) with fitness test of model.

Note: Some of the practicals form the above practical list may have seemingly similar definitions. For better learning and good practice, it is advised that students do maximum number of practicals. In the practical examination, the definition asked need not have the same wordings as given in the practical list. However, the definitions asked in the exams will be similar to the ones given in the practical list.

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Syllabus for Master of Computer Applications, 4th Semester
Subject Name: Mobile Computing (MC)
Subject Code: 4649303

1. Learning Objectives:

- To be able to understand the process of developing software for the mobile
- To be able to create mobile applications on the Android Platform
- To be able to create mobile applications involving data storage in SQLite database.

2. Prerequisites: Knowledge of the Core Java Programming, database concepts

3. Contents:

Unit No.	Course Content	Weightage Percentage
Unit I	**Introduction to ANDROID :** ANDROID SDK Features, Introduction to Development Features **Basics of ANDROID** Developing for ANDROID, developing for mobile and embedded devices, ANDROID development tools **Creating Applications using ANDROID** Basics of an ANDROID application, introduction to manifest, externalizing resources, application life cycle, ANDROID activities	10%
Unit II	**Building user interfaces** Introduction to layouts, introduction to fragments, creating new views, introduction to adapters **Intents and broadcast receivers** Introduction to intents, creating intents and broadcast receivers **Using Internet resources** Downloading and parsing Internet resources, using the download manager, using Internet services	25%
Unit III	**Files, saving state and preferences** Creating, saving and retrieving shares preferences, including static files as resources, working with the file system **Database and content providers** Introducing ANDROID databases, content values and cursors, working with SQLite databases, creating content providers, using content providers, native ANDROID content providers	25%
Unit IV	**Working in background** Introducing services, using background threads, using alarms **Enhancing user experience** Introduction and addition of action bar, menus and dialogs, drawables and gradients, custom animations	

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	Maps and location based services (Using location based services, selecting a location provider, finding your current location, creating map based activities)	**20%**
Unit V	**Audio, video and using the camera** Playing audio and video, manipulating raw audio, using camera to take pictures, recording video, adding media to media store **Telephony and SMS** Hardware support for telephony, using telephony, introducing SMS and MMS **Monetizing, promoting and distributing the applications** Signing and publishing applications, distributing applications, introduction to monetizing applications	**20%**

Desirable Topics:

1) Navigation drawer. recycler view and material design: https://developer.android.com
2) Android 9 Overview (Kotlin)

4. Text Book:

1) Reto Meier Professional ANDROID 4 Application Development, WROX Latest Edition

5. Reference Books:

1) Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2) Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd (2009)
3) Sayed Y Hashimi and Satya Komatineni, "Pro Android", Wiley India Pvt Ltd (2009)

6. Chapter wise Coverage from Text Book:

Unit No	Chapters
I	Chapter 1,2,3
II	Chapter 4,5,6
III	Chapter 7,8,9
IV	Chapter 10,11,13
V	Chapter 15, 17,19

Tools/Technologies to be used:

1) ANDROID Studio [Latest Version]
2) ANDROID Version [Jelly Bean and later]

7. Accomplishments of the student after completing the course:
Student will visualize the real world mobile application scenario and enables them for development and implementation of mobile applications

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Practical List

Tools/Technologies to be used:
Android or Android Studio [Latest Version]

Part 1: Mandatory

1.   Installing "Android Studio IDE" and "Android SDK"
Step 0: Pre-Installation Check List
Step 1: Install "Android Studio IDE" ((For Windows), (For Mac OSX) (For Linux))
Step 2: Installing Android SDK

2.   Write your First Android App
   2.1 Hello-World

   Step 1: Create a New Android Project
   Step 2: Setup Emulator (aka Android Virtual Device (AVD))
   Step 3: Run the Android App on Emulator
   Step 4: Run the Android App on Real Devices

   2.2 Hello-world "by Coding"

   Create User Interface (UI) on Android: (1) Write Java codes; (2)
   Layout via XML descriptions and let the system generates the Java
   Code for you.
   -       *MainActivity.java*
   -       Dissecting the "*MainActivity.java*" - Application, Activity & View
   -       Android Application Descriptor File - "AndroidManifest.xml"
   -       Common Errors□Modify

   2.3 Hello-World using "XML Layout"

   Step 1: Create a New Android Application
   Step 2: Define the Layout in XML *res\layout\activity_main.xml*"
   Step 3: Defining String References and Values r*es\values\string.xml*"
   Step 4: The Activity - "*MainActivity.java*"
   Step 5: Run the App

3.   Create "Hello World" application. That will display "Hello World" in the middle of the screen in the red color with white background.

4.   Create an application that designs a layout with a text box and button named Submit. The user should enter the text in the text box. When the submit button is clicked then the text in the text box should be displayed in the toast.

5.   Create an application to demonstrate Android Activity Life Cycle.
6.   To understand Activity,

Intent Create sample application with login module.(Check username and password) On successful login, go to next screen. And on failing login, alert user using Toast. Also pass username to next screen.

7. Create an application that designs a layout having two text boxes user name and password. The user and password will be taken from the user. The username and password will be verified from the username and password stored in the resources folder. If the verification is successful then a new layout will appear which will open any URL in browser.

8. Create an application to call specific entered number by user in the Edit Text

9. Create an application that will show List of Countries in One fragment , and on selecting one country, second fragment should be displayed with name selected country and its flag.

10. Understanding of UI :

a. Create an UI such that, one fragment of screen have list of all the types of cars.

b. On selecting of any car name, second fragment of screen should show Car details Like: name, launched date, company name, images (using gallery) if available, show different colors in which it is available.

11. Android Program to Perform all Operations using Calculators

12. Understand resource folder & Adapter :

a. Create spinner with strings taken from resource folder (res >> value folder).

b. On changing spinner value, change image.

13. Create an application that parses given XML File.

14. Create an application that parses given JSON File.

15. Create an application that fetches foreground and background colors from User. Save it as preference. On the next screen change background color and font color based on values passed by user. If no preferences are set then use Black and White as default background and foreground color respectively.

16. Create an application that designs a layout having two text boxes user name and password. The user and password will be taken from the user. The username and password will be verified from database. If the verification is successful then a new layout will appear which will contain text "Welcome ,<UserName>" otherwise displays error message.

17. Create an application that will create database with country table(Country short Name (IND), Name). Create an application to make Insert, update, Delete and retrieve operation on the database.

18. Understanding content providers and permissions: Read phonebook contacts using content providers and display in list.

19. Android Program to Demonstrate Layouts in an Activity and Nesting of Layouts and Demonstrate List View Activity

20. Create application that works like an alarm.

21. Understand Menu option and Context Menu : Create an application that will change color of the screen, based on selected options from the menu.

22. Create an application that will have spinner with list of animation names. On selecting animation name, that animation should affect on the images displayed below.

23. Android Program to Demonstrate an Adapter and Advanced Adapter.

24. Android Program to Demonstrate Broadcast Receiver, Broadcast Receiver to Intercept Custom Intent, Pending Intent, OrderedBroadcast.

25. Android Program to Demonstrate Intent Filter, Local Broadcast Manager, to Monitoring Device State Changes Using Broadcast Intents.

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26. Android Program to Open an Internet Data Stream.

27. Android Program to Parse Xml Using Xml Pull Parser, Parse Xml Using Dom Parser.

28. Android to demonstrate Download Manager in Android, Android Program to Demonstrate Connection to an Internet Resource.

29. Android Program to Demonstrate Creating and Saving Shared Preferences and Demonstrate Preference Screen and Sub-screen in a Preference Screen and Intent in Preference Screen.

30. Android Program to Demonstrate Preference Fragment, Preference Headers Preference Activity.

31. Android Program to Demonstrate Reading a File on SD Card, Reading and Writing to a File in Android and Instance Save State.

32. Create an application that will play a media file from the memory card.

33. Create an application to take picture using native application.

34. Create an application to pick up any image from the native application gallery and display it on the screen.

35. Read messages from the mobile and display it on the screen.

36. Create an application to send message between two emulators.

37. Android Program to Demonstrate Action Bar in Android, Disable the Action Bar in an Activity, Hide Title Label of Action Bar in Android, Add Actions in Action Bar, Respond to Added Actions in Action Bar in Android, Change the Displayed Text alongside the Application Icon at Runtime, Change the Background of Action Bar in Android.

38. Android Program to Demonstrate Shape Drawables, Gradient Drawables, Radial Gradient, Sweep Gradient in Android.

Part 3: Advanced (Mandatory)

39. Create an application that designs a layout having a rating bar. Whenever user gives the rating then a dialog box should appear with a message and button OK. The message in the rating bar should be displayed (e.g.: 1.5 rating selected) 'You have given 1.5 Rating'. When button OK is pressed than the dialog box should disappear.

40. Create an application that designs a layout to take contact label (name) and phone no from the user and store in the contacts using content provider. Also design a layout to read phone contacts stored using content provider and display contact label (name) in list view. When the user selects any contact label (name) from the list view dialer application should be launched and call should be made using dialer application.

41. Create an application that designs a layout with spinner and an image view. The spinner should contain various shapes like circle, rectangle and rounded rectangle. When a shape is selected from the spinner that shape should be drawn in the image view. (Hint: Use shape Drawable or xml files for shapes on image view)

42. Create an application that designs a layout containing a list view having options:

a. Create file

By clicking on first option Create file a new layout should be displayed having two text boxes file name and file data and one button save. Both file name and data of the file should be entered by the user and on clicking save the file should be saved and proper message should be displayed on saving a file.
b. Delete file

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By clicking on second option delete file a new layout should be displayed having one text box file name and one button delete. The file name should be entered by the user and on clicking delete the file should be deleted and proper message should be displayed on deleting a file.

c. Display File.

By clicking on third option display file a new layout should be displayed having one text box for file name and one text view for file data and one button display. The file name should be entered by the user and on clicking the display button the contents of the file should be displayed in text view.

43. Create an application that designs a layout with 3 text boxes and an options menu. The options menu should contain options like Simple Interest and compound Interest. The text boxes should be used for the input of information like the principle amount, rate of interest and number of years. Then clicking on the option from menu appropriate operation should be performed and correct result should be displayed.

44. Create an application that designs a layout having text boxes and button submit. The details of doctor like doctor's first name, last name, mobile number, address, city and specialization should be entered by the user in the textboxes and on clicking on the button submit the data should be saved into the database. Create another layout that contains a text box, a button search and a text view that gives searching facility. User can search doctor's full information by providing doctor's name in the text box. On clicking on button search the information of the doctor should be displayed in text view.

Doc_detail (doc_id, firstname, lastname, mob, add, city, specialization)

45. Create an application that designs a layout with a list view and fetches the audio files stored in the SD Card. The names of the Audio files should be displayed in the list view. When the user clicks on the specific file name the title and duration of the audio should be displayed in the next layout.

46. Create an application that designs a layout having gallery of images and an image view. The gallery contains number of images. Whenever an image is selected from the gallery it should be displayed in the image view. The images should be fetched from the resources folder. (You can take any readymade image available or you can create your own)

47. Create an application that designs a layout having options menu and 2 text boxes for currency converter which allows user to select a particular conversion from following options.

a. Rupees to dollars
b. dollars to Rupees
c. Rupees to pound
d. Pound to Rupees

The data for conversion should be entered by the user in textbox. Then clicking on the option from menu appropriate operation should be performed and correct result should be displayed.

48. Create an application that designs a layout which provides field for enrollment number (text box), student's name (text box), course (radio buttons), semester (radio buttons)) and marks for sub1 (text box), sub2 (text box), sub3 (text box) and a button name submit. When user clicks on submit button data should be added to database. Design a layout which displays current record and previously added record in a tabular manner. Total should be calculated automatically and then stored into the database.

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Stud_marks(en_no, stud_nm, course, sem, sub1, sub2, sub3, total)

49. Create an application that designs a layout having a list view having two options:

a. Add contacts

On selection of the first option a new layout should be displayed containing two text boxes name and phone no and a button save. The name and phone no should be entered by the user and on clicking the save button the contact should be saved in the contacts directory and appropriate message should be displayed.

b. Display contacts.

On selection of second option display contacts a new layout should be displayed with list view and all the names from the contacts should be fetched and displayed in the list view. (Hint: Use Contacts Contract Content Provider).

50. Create an application that designs a layout of a student registration form. The layout should contain fields like first name, last name, phone no, date of birth (use date control) gender (use radio buttons), hobbies (use check boxes) and a button register. On clicking register an alert dialog box should appear with a message "do you want to register" and with two buttons yes or no. If yes is clicked then a new layout should appear where all the entered details should be displayed and also calculate the age (in years only) of the student and display it. If no is clicked than the alert dialog box should disappear.

51. Create an application that designs a layout for making an Admission Form. The layout should contain details like student enrollment no (textbox), Sem (spinner), Course (spinner), Date (date control), DOB (Date picker), SSC marks (textbox), HSC Marks (spinner), CMAT Score (Textbox) and a button named Submit. When the button submit is clicked than a new layout should be opened that displays all the student details as a summary and also display Merit Score. Merit Score should be calculated when the submit button is clicked.

Merit score = Average of (SSC marks, HSC Marks, CMAT score)

52. Create an application that designs a layout to store Result Details for MCA. The layout must contain details like name (textbox), Sem 1 Marks(spinner), Sem 2 Marks(spinner), Sem 3 Marks(spinner) , Sem 4 Marks(spinner), Sem 5 Marks(spinner) , Sem 6 Marks(spinner) and a Button named Submit.

Note: Marks must be from (AA, AB, BB, BC, CC and FF)

When the submit button is selected all the details should be saved in the database. Also provide a layout to perform the following operations:

a. Update the Marks /grade.
b. Search the Students on basis of his marks / grade.

53. Create an application that designs a layout to store Student Details. The layout should contain information like: Roll number (textbox), Name (textbox), Birth date (Date Picker), Marks1 (textbox), Marks2 (textbox), Marks3 (textbox) and button submit. When button submit is clicked than all the details must be saved in the database. Also percentage and total should be calculated automatically and saved into the database. Also design a layout to perform following operations:
a. Update Any student's marks

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b. Search the student details by roll no
c. Delete any student by roll no

54. Create an application to implement shopping cart.
55. Create an application to provide feedback using text and rating(do not use text box).

Part 4: Desirable

56. Create an application that creates an XML file with <Customer> as main tag. The structure of XML file should be as follows:

<Game>
< Game -id> </ Game -id>
< Game -name> </ Game -name>
< Game -price> </ Game -price>
</ Game>

Design a layout containing a list view which fetches all the Game names in the list view. When the user selects any particular Game name than a new layout should be displayed with a text view and all the information regarding that Game should be fetched from the XML file and displayed in the text view

57. Android Program to Demonstrate Material View Design.

58. Android Program to Demonstrate Recycler view.

59. Android Program to Demonstrate Navigation Drawer, Navigation Using Fragments, adding actions to Navigation Bar in Android, Navigation Drawer with Different Fragments in Android, Tab Navigation in Android, Drop down Navigation in Android.

Note: Some of the practicals form the above practical list may have seemingly similar definitions. For better learning and good practice, it is advised that students do maximum number of practicals. In the practical examination, the definition asked need not have the same wordings as given in the practical list. However, the definitions asked in the exams will be similar to the ones given in the practical list.

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Syllabus for Master of Computer Applications, 4ᵗʰ Semester
Subject Name: Software Project -2 (Data Science)
Subject Code: 4649304

With effective from academic year 2018-19

1. **Learning Objectives:**
   - To be able to develop Data Science Project using open source technologies
   - To learn Data Processing, Visualization and Analytical techniques on data set

2. **Prerequisites:** Knowledge of Programming Language, Python and Database concepts

3. **General Guidelines for Data Science Project using Open source Technologies**

   1) Group: 2-3 Person.
   2) The project should be free from plagiarism of any kind.
   3) It is mandatory that the project should be developed using Python on Linux or Windows Platform. Linux is the preferred platform
   4) Project must have proper documentation
   5) This may not be a live project
   6) Use of a data set is mandatory
   7) Use of Data Visualization and Analytical methods is mandatory
   8) Use of any popular Libraries/Framework based on Python is not prohibited, in which case the framework internals should also be known.

4. **Knowledge about the following is expected to be demonstrated.**

   1) Proper knowledge about the purpose of the application
   2) Use of Large Data set
   3) Use of Data pre-processing (Cleaning, Dimension reduction etc.)
   4) Use of Data Visualization
   5) Use of Data Analytical algorithm

5. **Expected Outcome**

   1) The objective of the Data Science Project Development is to make students aware about the industry based process and workings. As a result, Project must meet with the industry standards.
   2) There will not be any compulsion to prepare a project report for the students but an application and supportive documents should be self-explanatory, so that evaluator may get the detail about the Project developed and can evaluate the students as per the evaluation criteria.
      - Group size: 2-3 Persons.
   3) Power Point Presentation Content (30 Slides Max.):

Business Objective	Introduction, Problem Statement
Plagiarism Report	Similarity should be less more than 30%
Understand Data	About Data Source Understand Data: Basic Questions Understand Data: Data Wrangling Understand Data: Exploratory Analysis

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Methodology	Extract Features & Model, Methodology
Data Visualization	Implementation of Data visualization Techniques
Present Results	Present Results
Conclusion	Conclusion
References	References
YouTube Link (*)	

Note (*): It is preferable to have project Presentation uploaded on YouTube.

6. Suggested

PS: Below list (a & b) are suggestive one. You may select any other relevant topics/Data Sets.

a) Project Definitions
1) A Study on Employee Attrition Prediction and Analysis
2) A Study on Student Dropout Prediction and Analysis
3) A Study on Student Result Prediction and Analysis
4) A Study on Heights and Weights Data
5) A Study on Loan Prediction and Analysis
6) A Study on Housing Data
7) A Study on Weather Data
8) A Study on Movie Lens (https://movielens.org)
9) A Study on Trip Data
10) A Study on Census and Income Data
11) A Study on Songs Data
12) A Study on Sales Data
13) A Study on Online Shopping Data
14) A Study on Cyber Crime Data
15) A Study on Airline Safety
16) A Study on Spam emails /Get rid of Spam emails ()
17) A Study on Pictures / Working with Pictures
18) Working with Handwritten Information
19) Analyzing Reviews (e.g. amazon.com)

b) Suggested Data Sets
1) Kaggle Data Sets (https://www.kaggle.com/datasets)
2) Data.gov Data Sets (https://data.gov.in/https://www.data.gov/)
3) kdnuggets Data Sets (https://www.kdnuggets.com/datasets/index.html)
4) Titanic Data Set. (https://www.rdocumentation.org/packages/titanic/versions/0.1.0)
5) Boston Housing Data Set.
(https://www.cs.toronto.edu/~delve/data/boston/bostonDetail.html)
6) Walmart Sales Forecasting Data Set. (https://data.world/just4jcgeorge/walmart-sales-datahttps://relational.fit.cvut.cz/dataset/Walmart)
7) Hubway Data Visualization Challenge. (**https://anitagraser.com/projects/hubway-data-visualization-challenge/**)

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8) Text Mining Data Set. (https://archive.ics.uci.edu/ml/datasets.htmlhttp://www.rdatamining.com/resources/datahttps://searchbusinessanalytics.techtarget.com/feature/Simple-data-mining-examples-and-datasets)

9) Census Income Data Set. (https://www2.1010data.com/documentationcenter/prod/Tutorials/MachineLearningExamples/CensusIncomeDataSet.html)

10) Movie Lens Data Set. (http://files.grouplens.org/datasets/movielens/ml-latest-small-README.htmlhttp://files.grouplens.org/datasets/movielens/ml-latest-README.html)

11) Yelp Data Set. (https://www.yelp.com/datasethttps://catalog.data.gov/dataset/yelp-datahttps://github.com/vc1492a/Yelp-Challenge-Dataset)

12) AWS Public Data Sets (https://aws.amazon.com/opendata/https://registry.opendata.aws/)

13) Google Public Data Sets (https://cloud.google.com/public-datasets/https://www.google.com/publicdata/directoryhttps://ai.google/tools/datasets/)

14) Wikipedia Data Sets (https://en.wikipedia.org/wiki/Wikipedia:Database_downloadhttps://meta.wikimedia.org/wiki/Datasetshttps://wiki.dbpedia.org/data-set-34https://piktochart.com/blog/8-useful-databases-to-dig-for-data/https://perso.telecom-paristech.fr/eagan/class/igr204/datasets)

15) UCI Machine Learning Repository (https://archive.ics.uci.edu/ml/index.php)

16) World Bank Data Sets (https://data.worldbank.org/indicatorhttp://wdi.worldbank.org/tableshttps://openknowledge.worldbank.org/http://www.worldbank.org/en/news/feature/2012/03/29/world-bank-more-open-accessible-and-searchable-data-support-vietnams-developmenthttps://twitter.com/worldbankdata?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor

17) Academic Torrents Data Sets (http://academictorrents.com/browse.php?cat=6http://academictorrents.com/collection/nasa-datasetshttps://www.techleer.com/articles/545-academic-torrents-a-distributed-system-for-sharing-enormous-datasets/)

18) Twitter Data Set (https://twitter.github.io/typeahead.js/examples/https://github.com/twitter/typeahead.js/issues/1004https://github.com/guyz/twitter-sentiment-datasethttps://data.world/datasets/twitterhttps://old.datahub.io/dataset/twitter-sentiment-analysis

19) https://vincentarelbundock.github.io/Rdatasets/datasets.html

20) https://www.dataquest.io/blog/free-datasets-for-projects/

7. Evaluation

Sr. No	Particulars	Weightage
1	Topic & Selection of Algorithm	10%
2	Data Pre-processing (Cleaning, Reducing Dimensionality)	30%
3	Data Visualization	20%
4	Data Analysis / Algorithm	30%
5	Result	10%

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Recommended Book(s):

1) Field Cady, 'The Data Science Handbook ', Wiley Publication ISBN-13: 978-1119092940
2) Jake VanderPlas, 'Python Data Science Handbook ESSENTIAL TOOLS FOR WORKING WITH DATA', O'REILLY ISBN:978-1-491-91205-8
3) Rachel Schutt and Cathy O'Neil, Doing Data Science, O'REILLY
4) Wes McKinney,Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython, 2nd Edition , O'REILLY
5) Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012
6) John W. Foreman (Author), Data Smart: Using Data Science to Transform Information into Insight, WILEY
7) John Paul Mueller, Luca Massaron, Python for Data Science For Dummies , WILEY

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Syllabus for Master of Computer Applications, 4ᵗʰ Semester
Subject Name: Java Web Technology (JWT)
Subject Code: 4649305

With effective from academic year 2018-19

1. Learning Objectives:
- To learn and work with the web components of Java EE. i.e. the Servlet specification.
- Student will be able to learn MVC architecture and develop dynamic web application using Java Servlet and Java Server Pages technology.

2. Prerequisites: Programming Language of JAVA, HTML, JavaScript and JDBC

3. Contents:

Unit	Course Content	Weightage Percentage
Unit I	**Servlet Basics, Handling the Client Request: Form Data, HTTP Request Headers** Servlet Basics, Basic Servlet structure, Servlets Generating text/html content, Packaging Servlets, The servlet life-cycle. Handling Client Request Form Data, Reading Form Data from Servlets, Handling Client Request: Reading Request Headers, Understanding HTTP/1.1 Request Headers: Changing the page according to how the user got there and accessing the Standard CGI Variables.	20%
Unit II	**Server Response, HTTP Status Codes, HTTP Response Headers, Handling Cookies and Session Tracking** Specifying Status Codes, HTTP / 1.1 Status Codes, Using Redirections, HTTP Response Headers: Setting Response Headers from Servlets, Understanding HTTP / 1.1 Response Headers, Using Servlets to Generate JPEG Images, Handling Cookies: Remembering Usernames and Passwords, Deleting Cookies, Sending and Receiving Cookies, Using Cookie Attributes, Differentiating Session Cookies from Persistent Cookies, Using Cookies to Remember User Preferences, Session Tracking: Need for Session Tracking, Session Tracking API, Encoding URLs Sent to the Client and accumulating a List of User Data.	20%
Unit III	**Listeners and Filters** Using ServletContextListener, HttpSessionListener, Understanding of all the other Listeners viz. ServletRequestListener, ServletContextAttributeListener, ServletRequestAttributeListener, HttpSessionAttributeListener. Using Filters for pre and post processing of request.	10%
Unit IV	**Overview of Java Server Pages, Java Code with JSP Scripting, JSP Page Directives, Files and Applets in JSP and Java Beans Components in JSP** JSP Basic Syntax, HTML Text, HTML comments, Template Text, JSP Comment, JSPExpression, JSP Scriptlet, JSP Declaration, JSP Directives, JSP Action, JSP Expression Language Element, Custom Tag (Custom Action), Escaped Template Text, Using JSP Scripting Elements, Using Predefined Variables, XML syntax for Expressions, Scriptlets, Declarations and Directives, Using Scriptlets, Using Declarations, Using Page Directive, Using Standard Actions Tags<jsp:plugin>, <jsp:forward>,<jsp:include>,	20%

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		Using JavaBeans in JSP pages – <jsp:useBean>, <jsp:getProperty>, <jsp:setProperty>,Sharing Beans, Use of Scopes and their Attributes.	
Unit V		**Model-View-Controller (MVC), JSP 2.0 Expression and Accessing Database with JDBC** Integrating Servlets and JSP in a Web Application (MVC Architecture for Web Applications), Implementing MVC with Request Dispatcher, Understanding Data Sharing Between Servlets and JSP, JSP Expression Language, Accessing Scoped Variables, Bean Properties, Collections and Implicit Objects Using EL, Using EL Operators and Accessing Database with JDBC.	**20%**
Unit VI		**Declarative Security and Programmatic Security** Form-based authentication, Basic authentication, example, configuration Tomcat to use SSL, programmatic Security, Example, Handling all security programmatically, Example, Using programmatic security with SSL.	**10%**

4. Text Book(s):

1) Marty Hall, Larry Brown, "Core Servlets and JavaServer Pages Volume – 1", Pearson Education, 2nd ed.(2004)
2) Marty Hall, Larry Brown, Yaakov Chaikin, "Core Servlets and JavaServer Pages Volume – 2", Pearson Education, 2nd ed.(2004)

5. Reference Books:

1) Black Book "Java server programming" J2EE, 1st ed., Dream Tech Publishers, 2008.
2) Subrahmanyam Allamaraju, Cedric Buest, Professional Java Server Programming, Wiley Publication
3) Pravin Jain, The Class of Java, Pearson
4) Christian Bauer, Gavin King , Java Persistence with Hibernate, MANNING
5) Giulio Zambon, Beginning JSP, JSF and Tomcat, Apress
6) Cay S. Horstmann, "Core Java , Volume I – Fundamentals",   Pearson Education , 10th Edition, 2017
7) Cay S. Horstmann, "Core Java , Volume II – Advanced Features", Pearson Education , 10th Edition, 2017
8) Cay Horstmann and Gary Cornell, Core Java, Volume II: Advanced Features, Pearson Publication
9) James Keogh ,Complete Reference J2EE, McGraw-Hill publication

Web Resources
http://docs.oracle.com/javaee/6/tutorial/doc/bnafd.html

6. Chapter wise Coverage from the Text Book:

Unit #	Book#	Chapter
I	1	Chapter 3 (except 3.5, 3.7, 3.8), Chapter 4 (only 4.2), Chapter 5 (only 5.1, 5.3, 5.6 and 5.7),
II	1	Chapter 6 (except 6.4), Chapter 7 (only 7.1, 7.2 and 7.5), Chapter 8

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		(only 8.1, 8.3, 8.4, 8.6, 8.7, 8.11), Chapter 9 (only 9.1, 9.3, 9.5, 9.7)
III	2	Chapters 5, 6
IV	1	Chapters 10 (only 10.6), 11, 12, 13, 14
V	1	Chapters 15, 16, 17
VI	2	Chapters 3 (3.1 to 3.5), 4 (4.1 to 4.5)

7. Accomplishments

Students will understand advanced concepts related to MVC architecture, web services, servlet, spring and Hibernate. Students will be able to develop dynamic web applications using Java technology without need of other's help.

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Subject Code: 4649305

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Practical List

1) Write a Servlet to display "Hello World" on browser.

2) Write a Servlet to display all the headers available from request.

3) Write a Servlet to display parameters available on request.

4) Write a Servlet to display all the attributes available from request and context.

5) Write a Servlet which displays a message and also displays how many times the message has been displayed (how many times the page has been visited).

6) Assume that we have got three pdf files for the MCA-1 Syllabus, MCA-2 Syllabus and MCA-3 Syllabus respectively, Now write a Servlet which displays the appropriate PDF file to the client, by looking at a request parameter for the year (1, 2 or 3).

7) Assume that the information regarding the marks for all the subjects of a student in the last exam are available in a database, Develop a Servlet which takes the enrollment number of a student as a request parameter and displays the marksheet for the student.

8) Develop a Servlet which looks for cookies for username and password, and forwards to a home.jsp in case the cookies are valid and forwards to login.jsp, in case the cookies are not found or the cookies are not valid.

9) Write a servlet to implement Session tracking using all four methods.

10) Develop a Servlet to authenticate a user, where the loginid and password are available as request parameters. In case the authentication is successful, it should setup a new session and store the user's information in the session before forwarding to home.jsp, which displays the user's information like full name, address, etc.

11) Write a simple JSP page to display a simple message (It may be a simple html page).

12) Write a JSP page, which uses the include directive to show its header and footer.

13) Create a listener that notifies (through System.out) whenever a user adds a product to a shopping cart (i.e. adds an object to the session object) or removes it again. Hint: check out the class HttpSessionAttributeListener. Make it print the name and price of the object (hint: access the session through the HttpBindingEvent object). Also, let the listener print the total price of all objects saved in the session so far (one way to accomplish this could be to keep a collection of all objects saved to the session – or just their keys – in the listener or an associated class).

14) Create a servlet filter that logs all access to and from servlets in an application and prints the following to System.out:

1. the time the request was received

2. the time the response was sent

3. how much time it took to process the request

4. the URL of the resource requested

5. the IP address of the visitor

15) Develop a interest calculation application in which user will provide all information in HTML form and that will be processed by servlet and response will be generated back to the user.

16) Develop an application to demonstrate how the client (browser) can remember the last time it visited a page and displays the duration of time since its last visit. (Hint: use Cookie)

17) Develop an application to keep track of one user across several servlet invocations within the same browser session.

18) Develop an application to write a "page-composite" JSP that includes other pages or passes control to another page. (Hint: Use <jsp:include> or <jsp:forward>).

19) You want to reduce the amount of Java coding in your JSP using a JavaBean component. (Hint: Use <jsp:useBean> with the name of your bean).

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20) Write a JSP page which uses tags available from the standard tag library JSTL.

21) Update the JSP page from above exercise to use tags availabe from the standard tag library JSTL.

22) Develop a JSP Page to display the personal information and result information of the student in two different tabular formats.

23) Create the filter that can add the time at which above jsp file called with appropriate message.

24) Design a Listener that loads the name of company as an init-parameter in context.
Use this name on the JSP – product.jsp and contactus.jsp of the website. (HINT: Implement ServletContextListener interface)

25) Create a filter to maintain the log of suspicious access of a particular JSP.
Access to the JSP on Sundays is suspicious.
Also design the JSP for the application. The JSP should display the details about sales history of the company for past 7 years.
The output should be shown in excel format.

26) Design an application where a user enters username and password, and requests for a servlet. Use filter to validate the password use database. If password is valid servlet is given as response, otherwise give appropriate message through filter.

27) Develop a program to perform the database driven operation like insert, Delete, Update and select. To perform the above operations create one table named Employee.

Field Name	Field Type
EmpId	Integer
Empname	Varchar
Emp_desig	Varchar
Emp_J_Date	Varchar
Emp_Salary	Numeric

28) Write a Java application to invoke a stored procedure using a CallableStatement. For this a stored procedure called increment Salary may be developed to increase all the employees salary by a percentage specified in the parameter.

29) Write a Servlet which uses the concept of Request forwarding & including external source in the current servlet context.

30) Write a JSP Page to which uses Session Tracking for online shopping.

Note: Some of the practicals form the above practical list may have seemingly similar definitions. For better learning and good practice, it is advised that students do maximum number of practicals. In the practical examination, the definition asked need not have the same wordings as given in the practical list. However, the definitions asked in the exams will be similar to the ones given in the practical list.

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Syllabus for Master of Computer Applications, 4th Semester
Subject Name: Big Data Tools (BDT)
Subject Code: 4649306

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1. Learning Objectives:
- To understand basics of Big Data
- To understand various Big Data Tools

2. Prerequisites: Working knowledge of Programming Language and Database Concepts

3. Contents:

Unit	Course Content	Weightage percentage
Unit I	**Unit 1: Introduction to Big Data** Types of Digital Data: Classification of Data (Structured, Semi-structured and Unstructured), Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges of Big Data, Characteristics of Big Data (Volume, Velocity, Variety), Other characteristics of Big Data which are not Definitional Traits of Big Data, Why Big Data?, Are we Information Consumer or Producer? Traditional BI vs Big Data, Typical Data Warehouse Environment, Typical Hadoop Environment, What is Changing in Realms of Big Data? Terminologies used in Big Data Environments	15%
Unit II	**Unit 2: Introduction to NoSQL and Hadoop** **NoSQL:** Introduction: Where is it used? What is it?, Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NewSQL **Hadoop:** Introduction, Distributed Computing Challenges, History of Hadoop, Overview of Hadoop and Hadoop Ecosystems, Features and key advantages of Hadoop, Versions of Hadoop, Hadoop distributions, RDBMS versus Hadoop, Hadoop vs SQL, Integrated Hadoop Systems offered by leading market vendors, Cloud based Hadoop solutions, HDFS, Processing data with Hadoop, Managing Resources and applications with Hadoop YARN, Interacting with Hadoop Ecosystem	25%
Unit III	**Unit 3: Introduction to MongoDB and MapReduce** **MongoDB**: Introduction: What is MongoDB? Why MongoDb? (using JSON, Creating or generating a unique key, Support for Dynamic Queries, Storing Binary Data, Replication, Sharding, Updating information in – place), Terms used in RDBMS and MongoDb, Data types in MongoDb, MongoDB Query Language **MapReduce:** Data Flow, Map, Shuffle, Sort, Reduce, Hadoop Streaming, mrjob, Installation, wordcount in mrjob, Executing mrjob	25%

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Unit IV	Unit 4: Introduction to HIVE and Pig	25%
	HIVE: Introduction: What is HIVE? HIVE Architecture, HIVE data Types, HIVE File Formats, HIVE Query Language, RCFile implementation, SerDe, User-Defined Functions (UDF) **Pig:** Introduction: What is Pig? The anatomy of Pig, Pig on Hadoop, Pig philosophy, Use Case for Pig- ETL Processing, Pig Latin overview, Data types in Pig, Running Pig, Execution modes of Pig, HDFS commands, Relational operators, Eval function, Complex Data Types, Piggy Bank, User-defined Functions, Parameter substitution, Diagnostic Operator, Word Count Example using Pig, When to use and not use Pig? ,Pig at Yahoo, Pig vs HIVE.	
Unit V	Unit 5: Overview of SPARK Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs	10%

4. Text Book(s):

1) Seema Acharya, Subhashini Chellappan, " Big Data and Analytics", Wiley India Pvt. Ltd.,2015
2) Matei Zaharia, Patrick Wendell, Andy Konwinski, Holden Karau ,"Learning Spark",O'Reilly Media,2015
3) Zachary Radtka and Donald Miner,"Hadoop with Python",O'Reilly Media,2016 (Free ebook is available on the following link)(As on 12-10-2018) https://www.oreilly.com/programming/free/hadoop-with-python.csp

5. Reference Books:

1) Shashank Tiwari, " Professional NoSQL", Wiley India Pvt. Ltd.,2011
2) Kyle Banker,Peter Bakkum,Shaun Verch,Douglas Garrett,Tim Hawkins,"MongoDB in Action", DreamTech Press, 2nd Edition ,2016
3) Chris Eaton,Paul Zikopoulos,Tom Deutsch,George Lapis,Dirk Deroos,"Understanding Big Data : Analytics for Enterprise Class Hadoop and Streaming Data", Mcgraw Hill Education (India)Pvt.Ltd.,2012
4) Tom White,"Hadoop: The Definitive Guide",O'Reilly Media,4th Edition,2015
5) Vignesh Prajapati,"Big Data Analytics With R and Hadoop", Packt Pub Ltd ,2013
6) Dt Editorial Services,"Big Data - Black Book", Dreamtech Press,2016

Web Resources:

a) http://www.bigdatauniversity.com
b) http://www.mongodb.com
c) http://hadoop.apache.org/

6. Unit wise coverage from Textbook(s):

Unit 1	Book#	Topics
I	1	Chapter. 1, 2, 3.12

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II	1	Chapter 4,5
III	1,3	Chapter 6 (Book 1), Chapter 2 (Book 3)
IV	1	Chapter 9,10
V	2	Chapter 1,2 and 3 (For Chapter 2 and 3, only Python, No Java, No Scala)

7. Accomplishment

Student will understand fundamentals of Big Data, Tools and Techniques.

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Practical List

Part I: MongoDb

- Learn to Use MongoDB Atlas (The Cloud Version of MongoDB)
- Install and configure MongoDB

MongoDB Shell Commands / Queries: View all databases, Create new database, Drop existing database, View current database, Switch over to a given database, db.help(), Display statistics of a given database, Display current version of MongoDB Server, Display list of collections in current database, Create Collection, Drop Collection, CRUD operations (Create, Read, Update, Delete), Insert, Update else insert, save, update, remove, Find, Dealing with Using NULL Values, Count, Limit, Sort, Skip, Arrays and Array Operations, Aggregate

1) Create a StudentMaster database with a collection called "Student" containing documents with some or all of the following fields: StudentRollNo, StudentName, Grade, Hobbies, and DOJ. Perform the following operations on the database:
   1. Insert 10 Records in the database.
   2. Find the document wherein the "StudName" has value "Ajay Rathod".
   3. Find all documents in proper format. (Without _Id field)
   4. Retrieve only Student Name and Grade.
   5. Retrieve Student Name and Grade of student who is having _id column is 1.
   6. Add new field "Address" in Student Collection.
   7. Find those documents where the Grade is set to 'VII'.
   8. Find those documents where the Grade is not set to 'VII'.
   9. Find those documents where the Hobbies is set to either 'Chess'or is set to 'Dancing".
   10. Find those documents where the Hobbies is set neither to 'Chess' nor is set to 'Dancing".
   11. Find those documents where the student name begins with 'M'.
   12. Find those documents where the student name has an "e" in any position.
   13. Find those documents where the student name ends in "a".
   14. Find total number of documents.
   15. Find total the number of documents where Grade is 'VII'.
   16. Sort the documents in ascending order of student name.
   17. Display the last two records.

2) Create a MovieMaker Database with a collection called "Movies "containing documents with some or all of the following fields: titles, directors, years, actors. Perform the following operations on the database (either in the console or using any programming language):
   1. Retrieve all documents
   2. Retrieve all documents with Director set to "Quentin Tarantino"
   3. Retrieve all documents where actors include "Brad Pitt".
   4. Retrieve all movies released before the year 2000 or after 2010.

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5. Add a synopsis to "The Hobbit: An Unexpected Journey" : "A reluctant hobbit, Bilbo Baggins, sets out to the Lonely Mountain with a spirited group of dwarves to reclaim their mountain home - and the gold within it - from the dragon Smaug."

6. Add a synopsis to "The Hobbit: The Desolation of Smaug" : "The dwarves, along with Bilbo Baggins and Gandalf the Grey, continue their quest to reclaim Erebor, their homeland, from Smaug. Bilbo Baggins is in possession of a mysterious and magical ring."

7. Add an actor named "Samuel L. Jackson" to the movie "Pulp Fiction"

8. Find all movies that have a synopsis that contains the word "Bilbo"

9. Find all movies that have a synopsis that contains the word "Gandalf"

10. Find all movies that have a synopsis that contains the word "Bilbo" and not the word "Gandalf"

11. Find all movies that have a synopsis that contains the word "dwarves" or "hobbit"

12. Find all movies that have a synopsis that contains the word "gold" and "dragon".

13. Delete the movie "Pee Wee Herman's Big Adventure"

3) Create a database named "BookStore" in MongoDB with a collection called "Books" containing documents with some or all of the following fields: bookId, bookTitle, authors(containing fields: authorName), publicationYear, publisher, Orders(containing fields: OrderedId, orderDate, customerName, price, quantityOrdered, discount).
Note that a book may have one or more authors and orders. Also, the same OrdereId can be present in one or more books. Perform the following operations on the database (either in the console or using any programming language):

1. Insert records for 10 books from 5 authors, and at least 20 orders in total.

2. Update the title of a particular book.

3. Display all the books having less than 3 authors and sort by book name.

4. Display the number of books from each publisher.

5. Use MapReduce function to display the total quantity of books ordered for each date.

6. Use MapReduce function to display the discount offered to a particular customer.

4) Create a database named "Store" in MongoDB with a collection called "Sales" containing documents with some or all of the following fields: customerId, customerName, gender, dataOfBirth, contactNumber, address (containing fields: houseNo, street, area, city, pincode), orders(containing fields: orderId, orderDate, items(containing fields: itemId, itemName, itemPrice, quantityOrdered, discount)).
Note that some customers may not provide their date of birth and/or contact number. Also, not all products would be sold at a discount. Perform the following operations on the database (either in the console or using any programming language):

1. Insert records for 3 customers and 5 items in at least 20 orders.

2. Update the contact number of a particular customer.

3. Display customerId, customerName, gender, contactNumber, of customers residing in "Ahmedabad".

4. Display city-wise count of customers

5. Use MapReduce function to display the number of times each item was sold.

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5) Create a database "BookStore" with a collection called "Books" containing documents with some or all of the following fields: Category,BookName,Author,quantity, price,pages. Perform the following operations on the database:
   1. Insert Records for 5 books.
   2. Write Map & Reduce functions to split the books into the following two categories: Bigbooks, Smallbooks. (Books which have more than 300 pages should be in the Big books category. Books which have less than 300 pages should be in the Small books category.)
   3. Count the number of books in each category
   4. Store the output as follow as documents in a new collection called "Book_Result".

Book Category	Count of the Books
Big books	2
Small books	3

Part II: Hadoop HDFS

- Installation and configuration for: Apache Hadoop Stand-Alone Mode and Pseudo Distributed Mode
- Installation and configuration for: Apache Hadoop Real Cluster consisting of a single Master and Two Slave nodes.
- Test the above set-up with sample examples bundled along with the downloaded package.
- To develop and execute sample programs like word-count, maximum temperature, etc. Using Python with Map-Reduce in Hadoop
- HDFS Commands: -ls, -ls -R, -mkdir, -put, -get, -copyFromLocal, -copyToLocal, -cat, -cp, -rm-r
1) Create a file "Sample" in a local file system and export it to the HDFS File System.
2) Write the HDFS command for copying a "Sample" file from HDFS to local File System.
3) Write HDFS commands for creating "Test" directory in HDFS and then removing that directory.
4) Write HDFS command to display complete list of directories and files of HDFS.
5) Write HDFS command for displaying the contents of "Sample" text file in HDFS on screen.
6) Write HDFS command for copying an existing "Sample" file in a "Test" HDFS directory to some another HDFS directory.

Part III: MapReduce

1) Prepare an "input" folder containing multiple text files. Create a program using MapReduce that would accept the path to the "input" folder and generate an "output" folder having a text file containing the total number of occurrences of each single word present in text document. For example, if the text containing in input files is as follows:
"We thank you for your visit to Ahmedabad. We hope that you would visit us again."
The Output should be as follow:

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Word	Word Length	No of occurrences
We	2	2
To	2	1
Us	2	1
You	3	2
For	3	1
Your	4	1
That	4	1
Hope	4	1
Thank	5	1
Visit	5	2
Would	5	1
Again	5	1
Ahmedabad	9	1

2) Write a program for Matrix Vector Multiplication using MapReduce.

3) Write a program to perform Union, Intersection and Difference operation using MapReduce on following files.

   Input files:

   a) Content of file 1 (apple, orange, mango, apple, banana)

   b) Content of file 2 (apple, apple, plum, kiwi, kiwi, mango, mango)

   c) Content of file 3 (orange, orange, plum, grapes, kiwi, mango, apple)

Part IV: Pig

- Install and configure Apache Pig
- Test the Pig Installation for local and map-reduce mode execution
- Test the Pig Installation for Interactive (Grunt Shell) and Batch Mode (.pig file) Execution
- Develop UDF (User Defined Function) in Python for Pig

Working with Pig Operators/Functions (LOAD, DUMP, FOREACH, GROUP, DISTINCT, LIMIT, ORDER BY, JOIN, UNION, SPLIT, SAMPLE, AVG, MAX, COUNT, TUPLE, MAP,PIGGY BANK, PARAMETER SUBSTITUTION, DESCRIBE, Simple Problems like Word Count using PIG

1) Write a pig script to load and store "Student data".(Student file contain Roll no, Name, Marks and GPA).

   a) Filter all the students who are having GPA>5.

   b) Display the name of all Students in Uppercase.

   c) Group tuples of students based on their GPA.

   d) Remove duplicates tuple of Student list.

   e) Display first three tuples from "student" relation.

   f) Display the names of students in ascending order.

   g) Join two relation namely Student and department (Rno,DeptNo,DeptName) based on the values contain in the roll no column.

   h) Merge content of two relation Student and department.

   i) Partition a relation based on the GPA's acquired by students.

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j) To calculate the average marks for each student.
k) Calculate maximum marks of each student.
l) Count the number of tuples in a bag.

2) Load the file menu.csv (Category,Name, Price) and write one Pig script

a) Which meals cost more than 30.00?
b) Which meals contain the word "Panner "?
c) Which are the 10 most expensive meals?
d) For every day, what's the average price for a meal?
e) For every day, what's the most expensive meal?

3) Write a program to count Word on Pig.
4) Write a pig script to spilt customers for reward program based on their life time values.
If Life time values is >1000 and < =2000 then Silver Program
If Life time values is >20000 then Gold Program
Input:

Customers	Lifetime value
Jack	25000
Smith	8000
David	12000
John	15000
Scott	12000
Lucy	28000
Ajay	12000
Vinay	30000
Joseph	21000
Joshi	25000

5) Create a data file for below schemas:
Order: CustomerId, ItemId,ItemName,OrderDate,DelivaryDate
Customer: CustomerId,CustomerName, Address,City,State,Country
a) Load Order and Customer Data.
b) Write a pig latin Script to determine number of items bought by each customer.
6) Do the Following:
1. Create a file which contains bag dataset as shown below.

User Id	From	To
user1001	user1001@sample.com	{(user003@sample.com),(user004@sample.com), (user006@sample.com)}
user1002	user1002@sample.com	{(user005@sample.com),(user006@sample.com)}
user1003	user1003@sample.com	{(user001@sample.com),(user005@sample.com)}

2. Write a pig latin statement to display the names of all users who have sent emails and also a list of the people that have sent the email to.
3. Store the result in a file.

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7) Create a UDF to convert name into uppercase.

Part V: Hive
- Install and configure Apache Hive
- SerDe and User Defined Function Creation in Hive using Java

Create database, display list of existing databases, describe database, describe extended database, alter database properties, to make a given database as current database, drop database, create managed table, create external table, loading data into a table, working with collection data types, querying a table using select, querying collection data types, create static partition and load data into it from original table, static partition creation using alter, create dynamic partition, load data into dynamic partition, create bucket, create view, query view, drop view, sub-query, joins, Aggregation, Group By and Having, RC File Implementation

1. **Create a data file for below schemas**
   Order: CustId,ItemId,ItemName,OrderDate,Delivery Date
   Customer:CustId,CustName,Address,City,State,Country

   a) Create a table for Orders and Customer Data.
   b) Write Hive Query Language to find number of items bought by each customer.

2. Create a partition table for Customer Schema to reward customer based on their life time value.

Customer Id	Customers	Lifetime value
1001	Jack	25000
1002	Smith	8000
1003	David	12000
1004	John	15000
1005	Scott	12000
1006	Lucy	28000
1007	Ajay	12000
1008	Vinay	30000
1009	Joseph	21000
1010	Joshi	25000

   a) Create partition table if life time value is 12000.
   b) Create partition table for all life time values.

Note: Some of the practicals form the above practical list may have seemingly similar definitions. For better learning and good practice, it is advised that students do maximum number of practicals. In the practical examination, the definition asked need not have the same wordings as given in the practical list. However, the definitions asked in the exams will be similar to the ones given in the practical list.

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Syllabus for Master of Computer Applications, 4th Semester
Subject Name: Data Mining and Data Visualization (DMDV)
Subject Code: 4649307

With effective from academic year 2018-19

1. **Learning Objectives:**
   - To understand the need for Data Mining and advantages to the business world.
   - To get a clear idea of various classes of Data Mining techniques, their need, scenarios (situations) and scope of their applicability.
   - To learn the algorithms used for various type of Data Mining problems
   - To understand how to explore and communicate data using data visualization techniques

2. **Prerequisites:** Knowledge of RBMS and OLTP

3. **Contents:**

Unit	Course Content	Weightage Percentage
Unit I	**Introduction : Data Mining** An Overview; What is Data Mining; Why Data Mining?, What Kind of Data can be mined?, What Kind of Patterns Can be Mined? Major Issues in Data Mining, Data Objects and Attribute Keys **Data Pre-processing:** An Overview of Data Cleaning methods, Data Integration, Data Reduction and Data Transformation.	10%
Unit II	**Mining Frequent Patterns, Associations, and Correlations** **Basic Concepts:** Market Basket Analysis; Frequent Item sets, Closed Item sets, and Association Rules; **Frequent Pattern Mining Methods:** Apriori Algorithm: Finding Frequent Itemsets Using Candidate Generation; Generating Association Rules from Frequent Item sets **Which Patterns Are Interesting**?—Pattern Evaluation Methods (Strong Rules Are Not Necessarily Interesting, From Association Analysis to Correlation Analysis, A Comparison of Pattern Evaluation Measures) **Overview:** Improving the Efficiency of Apriori	15%

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Unit III	**Classification & Prediction**	20%
	Classification : Basic Concepts	
	Decision Tree Induction: Decision Tree Induction, Attribute Selection Measures; Tree Pruning; Scalability and Decision Tree Induction, Visual Mining for Decision tree induction	
	Rule-based Classification: Using IF-THEN Rules for Classification; Rule Extraction from a Decision Trees; An Overview of Rule Induction Using a Sequential Covering Algorithm	
	Bayesian Classification: Bayes' Theorem, Naive Bayesian Classification; Bayesian Belief Networks **Model Evaluation and Selection:** Metrics for Evaluating Classifier Performance, Holdout Methods and Random Sub sampling, Cross-validation, Bootstrap, Model Selection Using Statistical Tests of Significance, Comparing Classifiers Based on Cost–Benefit and ROC Curves	
	Techniques to Improve Classification Accuracy: Introducing Ensemble Methods, Bagging, Boosting and Adaboost, An Overview of Random Forests, Improving Classification Accuracy of Class-imbalanced data	
Unit IV	**Cluster Analysis**	20%
	Cluster Analysis (What is Cluster Analysis? Requirement for Cluster Analysis, Overview of Basic Clustering Methods); Distance Measures in Algorithmic Methods Partitioning Methods (K-Means, K-Medoids)	
	Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering, An Overview of BIRCH Multiphase Hierarchical Clustering using clustering feature tree, Chameleon Multiphase Hierarchical Clustering using Dynamic Modeling, Probabilistic Hierarchical Clustering,	
	Density-Based Methods (An Overview of DBSCAN: Density-Based Clustering Based on Connected Regions with High Density)	
	Outliers Analysis: What are Outliers? Types of Outliers, Challenges of Outliers Detection.	

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Unit V	**Introduction to Data Visualization**	20%
	Acquiring Data, Visualizing Data, Simultaneous Acquisition and Visualization, Applications of Data Visualization (Uses in the Public Sector, Business-to-Business and inter-Business Uses, Business-to-Consumer Uses), Control of Presentation, Faster and Better JavaScript Processing, Rise of HTML5, Lowering the Implementation Bar	
	Exploring the Visual Data Spectrum: Charting Primitives (Data Points, Line Charts, PerfChart, Seasonality Chart, Bar Charts, Pie Charts, Area Charts), Exploring advanced Visualizations (Candlestick Charts, Bubble Charts, Surface Charts, Map Charts, Infographics).	
	Making use of HTML5 CANVAS, Integrating SVG	
Unit VI	**Visualizing Data Programmatically**	**15%**
	Creating HTML5 CANVAS Charts (HTML5 Canvas Basics, Linear Interpolations, A Simple Column Chart, Adding Animations),	
	Startig with Google Charts (Google Charts API Basics, A Basic Bar Chart, A Basic Pie Chart, Working with Chart Animations)	

4. Text Books:

1) Han, J., Kamber, M., Pei, J. Data mining concepts and techniques. Morgan Kaufmann, 3rd Edition, 2011
2) Jon Raasch, Graham Murray, Vadim Ogievetsky, Joseph Lowery, "JavaScript and jQuery for Data Analysis and Visualization", WROX

5. Reference Books:

1) Field Cady, 'The Data Science Handbook The Data Science Handbook', Wiley Publication ISBN-13: 978-1119092940
2) Pieter Adriaans & Dolf Zentinge, "Data Mining", Addison-Wesley, Pearson (2000)
3) Vikram Pudi & P. Radhakrishnan, "Data Mining", Oxford University Press (2009)
4) G. K. Gupta, "Introduction to Data Mining with Case Studies", EEE, PHI (2006)
5) A Julie Steele and Noah Iliinsky, Designing Data Visualizations: Representing Informational Relationships, O'Relly
6) Scott Murray, Interactive Data Visualization for Web, O'Relly

6. Chapter wise Coverage from Main Book(s):

Unit#	Book#	Topics
I	1	**Chapter 1 (1.1,1.2,1.3,1.4,1.7),** **Chapter 2-2.1,2.2,** **Chapter 3- 3.1,3.2,3.3,3.4.1, 3.5**
II	1	**Chapter 6 (6.1, 6.2.1-6.2.3,6.3)**

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III	1	Chapter 8, 9.1
IV	1	Chapter 10.1,10.2,10.3,10.4.1, 12.1
V	2	Chapter 1,3
VI	2	Chapter 9

7. Accomplishments of the student after completing the course:

- Student will understand fundamentals of Data Mining.
- Ability to apply Apriori algorithm for Association Mining
- Ability to apply Decision Tree and Bayesian algorithms for Classification
- Ability to differentiate between Classification & Clustering, and similarly between Supervised Learning & Unsupervised Learning
- Ability to understand Data visualization and visualize data programmatically.

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Practical List

PART-I Data Mining Practical List

Tools: Data Mining using 'R' Programming / Python

1. Create your own data set (like customer, weather, agriculture etc.), load it and apply any pre-processing technique and clean the data, show results.
   a. Clean missing values
   b. Remove Data
   c. Data Smoothing using Binning
2. Pre-process and classify any data set like customer, agriculture, weather etc.
3. Implement Decision Tree algorithm by taking appropriate data set and predict the result. Calculate entropy and information gain.
4. Implement Association mining algorithm by taking appropriate data set and find support and confidence. Also show confusion matrix.
5. Implement Naive Bayesian algorithm taking any dataset of your choice and predict the result.
6. Implement K-means clustering algorithm by taking appropriate data set and predict the result.
7. Implement K-medoids clustering algorithm by taking appropriate data set and predict the result.
8. Implement CART algorithm by taking appropriate data set and predict the result.
9. Implement DBSCAN clustering algorithm by taking appropriate data set and predict the result.
10. Implement K-Nearest Neighbor algorithm by taking appropriate data set and predict the result.

Suggested Data set URLs:
   i) www.kdnuggets.com/**datasets**/
   ii) http://archive.ics.uci.edu/ml/

PART-II Data Visualization Practical List

Tools: HTML5(Canvas and SVG tags), D3.js, Google API, Canvas.js

A) Installation

1. Setup Environment for All the Tools

B) Develop the following Program Using HTML5 CANVAS and SVG TAG

1) Develop the Different basic Graphical Shapes using HTM5 CANVAS
2) Develop the Different Advanced Graphical Shapes using HTM5 CANVAS
3) Develop the Different basic Graphical Shapes using HTM5 SVG
4) Develop the Different Advanced Graphical Shapes using HTM5 SVG

C) Develop Following Program Using HTML5 and JavaScript

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5) Develop the simple bar chart usingTML5 CANVAS
6) Read the data .txt file and draw Data Table
7) Read the data .txt file and draw Simple Bar Chart
8) Read the data .csv file and draw Data Table
9) Read the data .csv file and draw Column Bar Chart
10) Read the data XML file and draw Data Table
11) Read the data XML file and draw Simple Chart
12) Read JSON Data and draw Data Table
13) Read JSON Data and draw Simple Chart

D) Develop Following Program Using HTML5 and D3.js   and Canvas.js

14) Showing the data as a column chart (simple)
15) Showing the data as a stacked column chart
16) Showing the Data as a column chart for four age group
17) Showing the data as a Line chart (single, fewer and multiple lines)
18) Showing the data as a Pie Chart (single and multiple pie)
19) Showing the data as a Bar Chart (Simple and multiple)

E) Develop Following Program Using HTML5 and Google Chats API and Map API

20) Using Google Charts API Basics draw charts like a Bar chart
21) Using Google Charts API Basics draw charts like a Line chart
22) Using Google Charts API Basics drawPieChart.
23) Using Google Charts API Basics draw Donut Chart.
24) Using Google Charts API Basics draw Candle Chart.
25) Using Google Charts API Basics draw other types of Chart.
26) Using Google API read JSON file and create Google Map.

**F) Develop the Dashboard using all types of Graphics charts using any one graphical
Tools (desirable)**

27) Building interconnected Dashboard

Note: Some of the practicals form the above practical list may have seemingly similar
definitions. For better learning and good practice, it is advised that students do maximum
number of practicals. In the practical examination, the definition asked need not have the
same wordings as given in the practical list. However, the definitions asked in the exams will
be similar to the ones given in the practical list.

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1. Learning Objectives:

- To understand the basic view of software quality and quality factors.
- To understand the Software Quality Assurance (SQA) architecture and the details of its components.
- To understand of how the SQA components can be integrated into the project life cycle.
- To be familiar with the software quality infrastructure.

2. Prerequisites: Software Engineering Basics, Basics of Java Programming

3. Contents:

Unit	Chapter Details	Weightage Percentage
Unit I	**Introduction to software Quality and Assurance** The software quality challenge, Software quality, Software quality factors Management and its role in software quality assurance	10%
Unit II	**Components of SQA** The components of the software quality assurance system – overview **Pre-project Software Quality Components** Contract review, Development and quality plans	15%
Unit III	**SQA Components in the Project Life Cycleand Strategies** Integrating quality activities in the project life cycle, Reviews, Software testing – strategies	25%
Unit IV	**Software Testing – Implementation**: Software Quality Implementation, Assuring the quality of software maintenance components, Assuring the quality of external participants' contributions, CASE tools and their effect on software quality	25%
Unit V	**Software Quality Infrastructure Components** Procedures and work instructions, Staff training and certification,Corrective and preventive actions, Documentation control	10%
Unit VI	**Software Quality Metrics** Software Quality metrics, Cost of Quality	15%

Desirable Topics:

1) Quality and Management Standards (ISO, CMMi, ISO/IEC, IEEE, EIA).

4. Text Book:

Daniel Galin, "Software Quality Assurance", Pearson Publication, 2009.

5. Reference Books:

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Subject Name: Software Quality Assurance (SQA)
Subject Code: 4649308

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1) KshirsagarNaik and PriyadarshiTripathy, Software Testing & Quality Assurance-Theory and Practice, Wiley Student edition
2) William E. Perry, Effective Methods for Software Testing, WILLEY, . 3rd Edition
3) Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.
4) M G Limaye, Software Testing, Tata McGraw-Hill Education, 2009

6. **Chapter wise Coverage from Main Reference Book(s):**

Unit No.	Text Books	Topics/Subtopics
I	Book-1	1.1 to 1.2, 2.1 to 2.6, 3.1 to 3.6, 26.1 to 26.4
II	Book-1	4.1 to 4.7,5.2 to 5.5, 6.1 to 6.4
III	Book-1	7.1 to 7.4, 8.1 to 8.5, 9.1 to 9.5,
IV	Book-1	10.1 to 10.4, 11.1 to 11.4, 12.2 to 12.3, 13.1 to 13.4
V	Book-1	14.1 to 14.4, 16.2 to 16.10,17.2 to 17.8 ,19.1 to 19.6
VI	Book-1	21.1 to 21.6, 22.1 to 22.3

7. **Accomplishments of the student after completing the course:**

- Utilize the concepts in software development life cycle.
- Demonstrate their capability to adopt quality standards.
- Assess the quality of software product.
- Apply the concepts in preparing the quality plan & documents.

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Practical List

A) Setup:

1. Download and install the **Java Software Development Kit (JDK)**

   http://www.oracle.com/technetwork/java/javase/downloads/index.html

2. Download "**Eclipse IDE for Java Developers**"

   http://www.eclipse.org/downloads/

3. **Download the Selenium Java Client Driver**

   http://seleniumhq.org/download/

4. **Configure Eclipse IDE with WebDriver**

B) Suggested Applications for QA & QC:

1	**Leave Management System with following modules:** a. Login – Two types of User: Admin and User b. Admin Functionalities: i. Manage Leave Types ii. Manage User Leaves iii. Manage Users iv. Manage Different Shifts v. Manage Reporting Groups and Team Structure c. Time and Attendance i. User can view his/her attendance detail ii. Admin can view user's attendance log iii. Admin can generate various report like LateIn, EarlyOut, etc.. d. Leaves i. User can apply leave and Admin can reject/approve ii. User can view his leave request log, can modify and cancel as well ** Many other functionalities can be added to make it more complex
2	**Recruitment System** a. Manage Positions and vacancies within an organization b. Manage Advertisement on the positions c. Manage vacancy process from application to acceptance or rejection d. Manage and Setup Interviews e. Maintain Database
3	**Consider the below module which is responsible for Package purchase and Payment in different currencies:** – The User can purchase one out of three packages namely, Basic, Moderate, & Premium. – The User can purchase a particular package in three currencies. – The available currencies are Dollar, which is by default, Pound, & INR. – User can change the currency only on first step of 3 which is while selecting the package. a. The User Selects the Package. b. The User calculates the VAT amount applicable with respect to the country selection.

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	c. The User pays online through debit/ credit card only. – List out all the possible Test Cases for above module. – List out critical step, which if not properly handled can deviate the user from the system. – List out the enhancement point which can avail user more flexibility about one of the above three steps.
4	**In Airline reservation system, the following features need to be tested namely,** a. Login b. Search and book flights c. Search and book packages d. Register Feature not in scope, e. Search and book hotels – Pre-requities: Database & Payment gateway's sanbox enviroment access should be available. – Prepare the Test Plan for the above with all the possible criteria need to be considered. – Prepare the Test Cases for the features in scope to be tested.(At least one for each above mentioned feature) – Prepare the Defect Report.
5	**Healthcare Web application with following modules:** a. Patient Registration b. Scheduling c. Treatment d. Billing
6	**Consider a School Management System,** which allows Parent to download Children's Progress Report and Results from School's website So How can we authenticate the User (parent)? & it has dual Authentication system integrated on LogIn page.
7	**Notepad "Save As" Functionality** What are the different scenarios that can be identified for testing a simple notepad save as functionality? The Save as does navigate to the file name and file path. Given these two fields what are the various scenario that can be applied for testing?

Part 1:   Test Planning (Desirable)
   a) Prepare Quality Plan for any Application like online shopping etc.
   b) Prepare Test Plan for any Application like Railway Reservation System etc.

   Output: Test plan and Quality Plan

Part 2: Software Testing (Manual) - Mandatory

   a) Create Test cases (Unit, Integration, System and Acceptance Test Cases) for Application
   b) Perform manual testing using test case created and prepare test Metrics

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Suggested Template for Test case creation.

Sr#	Test condition / Steps	Input	Expected Result	Actual Result	Pass/Fail

Write test cases using following techniques (Suggested)
i) Coverage
ii) Boundary Value Analysis (BVA)
iii) Equivalence Partition (EP)
iv) State Transition Technique
v) Error Guessing Technique

c) Test Case Management Tools like JIRA (desirable)

Part 3: Software Testing (Automated) - Mandatory
Test automation – script creation and execution

Tools: Selenium
A) Concepts

1	Introduction to Selenium , Installation and Setup
2	Selenium WebDriver Commands • Browser Commands • Navigation Commands • WebElement Commands • FindElement and FindElements Command • CheckBox & Radio Button Operations • DropDown & Multiple Select Operations • Handle Dynamic WebTables in Selenium Webdriver
3	Navigate back/forwards, get, refresh I_ loading a page in current window / New window 2. Move back and forward 3. Refresh Page
4	Interrogation: i) get window title ii) current url iii) Page source
5	Locating web elements by Id, ClassName,LinkText,PartialLinkText,Name,TagName, CssSelector , XPath
6	Inspecting elements in web browsers
7	Element interrogation
8	Manipulation : Click, submit, shift-click, special actions, type text, clear text, list box selection and manipulation commands
9	Synchronization: Page load time out, implicit wait, explicit wait , ExpectedConditions class
10	Window handling: size, position, handles, switch to
11	Screenshot/capture

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12	Browser profile: set preferrred language, changing user agent, enable extension
13	Cookies: reading, creating and deleting
14	Data Driven Testing ; Use pre-stored data as input and expected output (possibel data source file Excel)
15	Page Object Model : test scenario like shopping cart from login

B) Practical List

Write script and perform Following list of activities / test scenarios using offline and online web application (Permissible)

1	Open URL in different browsers (Chrome, Firefox, IE)
2	Perform mouse hovers and other events
3	To take snapshots.
4	Getting current time-stamp
5	To Handle a drop-down.
6	Handling 2 3 steps at a time like Website Registration+login+logout at a time in single run.
7	To Upload File.
8	Storing and fetching data from excel (E.g Registration data)
9	Radio button selection.
10	Checkbox Selection
11	Selection
12	Absolute/Relative XPaths
13	Basic Selenium framework (Advance).
14	Generate Reports (Advance)
15	Logging (Advance).
16	Handling multiple browser tabs.
17	Handling multiple div./frames of page. (Advance)
18	Handling browser's parent and child window.(Advance)
19	verifies an expected page title, UI Element, Text and Table content
20	Handling mouse over menu/sub-menu.
21	To Provide meaningful messages in assertions!
22	Test Login of any web application
23	Test Shopping cart
24	Test using excel file data as input
25	Generate test report

References:
https://www.softwaretestinghelp.com/selenium-webdriver-commands-selenium-tutorial-17/
http://toolsqa.com/selenium-webdriver/

Part 4:   Advanced Testing - (Desirable)
     a) Perform Security Testing

    1) Security testing for architecture, source code and user interface
    2) Vulnerability testing with help of open source and licensed tools

   References: www.owasp.org: OWASP guideline compliance verification

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Type: Manual / Automated (using Tool) - (Desirable)

b) Perform Performance Testing
Performance testing for functionality for 50 concurrent users

Type: Manual / Automated (using Tool) - (Desirable)

Part 5:   Issue Tracking (desirable**)**
Tools: JIRA, BugZilla

Web References:
1) http://www.opensourcetesting.org/
2) http://www.onestoptesting.com/

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Subject Name: Cyber Security & Forensic (CSF)
Subject Code: 4649309

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1. **Learning Objectives:**

- To understand the major concepts of Cyber Security and Forensics and to create the awareness through simple practical tips and tricks and to educate the students to learn how to avoid becoming victims of cyber crime
- To understand the major concepts of Cyber Security and Forensics and to create the awareness through simple practical tips and tricks and to educate the students to learn how to avoid becoming victims of cyber-crimes.
- The subject and the course content will help to the student who wish to take up cyber forensics as career as well as those who want to seek careers in cyber security.
- To gain experience of doing independent study and research in the field of cyber security and cyber forensics.

2. **Prerequisites:** Basic fundamental knowledge of Networking, Web Application, Mobile Application and Relational Database Management System

3. **Contents**

Unit	Course Content	Weightage Percentage
Unit I	**UNIT- I: Introduction to Cybercrime:** Introduction, Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Newsgroup Spam/Crimes from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses , Software Piracy, Password Sniffing, Credit Card Frauds and Identity Theft. Cyber offenses: How Criminals Plan that attack, Categories of Cybercrime, How Criminals Plan the Attacks: Passive Attack, Active Attacks, Scanning/Scrutinizing gathered Information, Attack (Gaining and Maintaining the System Access), Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector and Cloud Computing.	15%
Unit II	**Cybercrime: Mobile and Wireless Devices** Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era and Laptops.	10%
Unit III	**Tools and Methods Used in Cybercrime** Introduction, Proxy Servers and Anonymizers, Phishing, Password	25%

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	Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft): Types of Identity Theft, Techniques of ID Theft, Identity Theft- Countermeasures, How to Protect your Online Identity.	
Unit IV	**Cybercrimes and Cybersecurity: The Legal Perspectives** Introduction, Why Do We Need Cyberlaws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act , Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.	10%
Unit V	**Understanding Computer Forensics** Introduction, Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail : RFC282, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing and Antiforensics.	25%
Unit VI	**Forensics of Hand-Held Devices** Introduction, Hand-Held Devices and Digital Forensics, Toolkits for Hand-Held Device Forensics: EnCase, Device Seizure and PDA Seizure, Palm DD, Forensics Card Reader, Cell Seizure, MOBILedit!, ForensicSIM, Organizational Guidelines on Cell Phone Forensics: Hand- Held Forensics as the Specialty Domain in Crime Context .	15%

4. **Text Book:**

1) Nina Godbole, Sunit Belpure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and   Legal Perspectives", Wiley, 2011

5. **Reference Books:**

1) Dafydd Stuttard , The Web Application Hacker′s Handbook: Finding and Exploiting Security Flaws Paperback – Wiley, 2nd Edition, .
2) Wade Alcorn , Christian Frichot, Michele Orru, , The Browser Hacker's Handbook Book, WIley

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3) James Graham, Richar Howard,Ryan Olson, "Cyber Security Essentials", CRC Press, Tailor and Francis Group, 2011
4) Robert Jones, "Internet Forensics: Using Digital Evidence to Solve Computer Crime",
5) O'Reilly Media, October, 2005
6) Chad Steel, "Windows Forensics: The field guide for conducting corporate computer investigations", Wiley India Publications, December, 2006
7) Nelson Phillips, Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
8) Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
9) Peter Wayner, "Disappearing Cryptography – Information Hiding: Steganography & Watermarking", Morgan Kaufmann Publishers, New York, 2002.

Practical/ Tools:

1) Mike Shema, Anti-Hacker Tool Kit (Indian Edition), Mc Graw Hill.
2) Christian Martorella , Learning Python Web Penetration Testing,PAKT
3) Vijay Kumar Velu , Mastering Kali Linux for Advanced Penetration Testing, PAKT, Book 2017
4) Nipun Jaswal, Mastering Metasploit,: Take your penetration testing and IT security skills to a whole new level with the secrets of Metasploit, 3rd Edition Paperback – Import, 28 May 2018 by
5) Gilberto Najera-Gutierrez, Juned Ahmed Ansari, Web Penetration Testing with Kali Linux - PAKT, Third Edition February 2018

6. **Chapter Wise Coverage from Text Book:**

Unit	Book#	Topics
I	1	1.1 to 1.5, 2.1 to 2.8
II	1	3.1 to 3.12
III	1	4.1 to 4.12 , 5.1, 5.2, 5.3
IV	1	6.1, 6.3, 6.4, 6.5, 6.6, 6.8, 6.9, 6.10
V	1	7.1 to 7.14, 7.16, 7.17, 7.18, 7.19
VI	1	8.1, 8.3, 8.4, 8.8

Additional Topics:

Cybercrime: Illustrations, Examples and Mini-Cases, Scams
(Only for the referential context should not be asked in the examination)

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Real-Life Examples:

Example 1: Official Website of Maharashtra Government Hacked
Example 2: E-Mail Spoofing Instances
Example 3: I Love You Melissa – Come Meet Me on the Internet
Example 4: Ring-Ring Telephone Ring: Chatting Sessions Turn Dangerous
Example 5: Young Lady's Privacy Impacted
Example 6: Indian Banks Lose Millions of Rupees
Example 7: "Justice" vs. "Justice": Software Developer Arrested for Launching Website Attacks
Example 8: Parliament Attack
Example9: Pune City Police Bust Nigerian Racket

Mini-Cases:
       Mini-Case 1: Cyberpornography Involving a Juvenile Criminal
       Mini-Case 2: Cyberdefamation: A Young Couple Impacted
       Mini-Case 12: Internet Used for Murdering
       Mini-Case 13: Social Networking Victim – The MySpace Suicide Case
       Mini-Case 16: NASSCOM vs. Ajay Sood and Others
Online Scams:
       Scam No. 1 – Foreign Country Visit Bait
       Scam No. 2 – Romance Scam
       Scam No. 3 – Lottery Scam
       Scam No. 4 – Bomb Scams
       Scam No. 5 – Charity Scams
       Scam No. 6 – Fake Job Offer Scam
Financial Crimes in Cyber Domain:
       Financial Crime 1: Banking Related Frauds
       Financial Crime 2: Credit Card Related Frauds

7. **Accomplishment:**
   After learning the course the students should be able to: student should understand cyber-attack, types of cybercrimes, cyber laws and also how to protect them self and ultimately society from such attacks

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Practical List

Part I - Commands
1. Study of following network emulators:
   i) WHOIS Search
   ii) Whois CLI Command
   iii) Nslookup
   iv) Host
   v) Ping
   vi) Traceroute
   vii) Netstat
   viii) Tcpdump and Windump
2. Create a malicious program that is (Atleast one program):
   i) Virus
   ii) Worm
   iii) Trojan
   iv) Dropper
3. TCP / UDP connectivity using Netcat
4. TCP scanning using NMAP.
5. Port scanning using NMAP.
6. TCP / UDP connectivity using Netcat.

Part II - Exploits

7. Exploit Web application Security using DVWA (Manual).
   Command Execution
   - SQL Injection
   - File Inclusion
   - XSS /CSIRF
   - Brute Force

8. Exploit Web application Security using DVWA
   Automated SQL injection with SqlMap .

Part III - Forensics
9. Perform a forensic analysis through autopsy sleuth kit.
10. Perform forensic analysis through helix.
11. Study of Forensic Tools (Study any TWO)
    - Password Clearing
    - File Recovery
    - Data Hiding Techniques
    - Steganography
    - CheckSum
    - Hiren's BootCD

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Note: Above list is a suggestive, you may selective from Internet

Part IV: Desirable (add on knowledge)

1. Network vulnerability using OpenVAS.
2. Perform image acquisition of the first partition carry out a dead analysis on image.
3. Study "omni peek "and perform live network analysis to capture packets.
4. Perform forensic data recovery through (Icare) a disk drill.
5. Perform forensic hash analysis and integrity check of evidence through FCIV and windiff.
6. Securely deleting file permanently (use tool like File shradder).
7. Install Kali-Linux on a PC for using it as an attacklaunching/vulnerability exploiting machine.
8. Create an intentionally vulnerableLinux Machine using MetaSploitable2 on another machine.
9. Perform Scanning/Reconnaissance testing on above mentioned machine in 5) using the machine mentioned in 4) using tools like NMAPand OpenVAS.
10. Study and Use MetaSploit Framework (already bundled with Kali Linux) present in machine to exploit vulnerabilities in the target vulnerable machine mentioned in5) using both command line and Armitage GUI utility.
11. Verify the integrity of a downloaded .tar.gz fileusing the shasum command. Eg. Hadoop Installation files can be taken as an example.Visit Hadoop Downloads Homepage:http://hadoop.apache.org/releases.html

Evaluation Parameters:
- Group Size : (2-3 Persons)
- Evaluation of the projects would be done considering Report (Pahse I,II and III). The main parameter of assessment would be the ability of the students to understand Cyber Security and Forensic concepts and process
- Though the project and domain specific knowledge would be not be assessed for, the evaluation would predominantly depend on the students' ability to explain, modify or execute security testing.
- Though the project would be evaluated for the entire team, the examiner should emphasize on the contribution of each team member in the project
- Documentation
  - Outcome: Report (Document) Minimum Pages : 50 Pages
  - The documentation should also include description related to Tools and methodologies used in.
  - Topics

I - Basics	a) Study, run and document (Part I)	20%
II - Exploit	Select an application and Exploit Web application Security using DVWA (Manual and Automate) Document work done	30%
III _ Forensic	A) Perform a forensic analysis through autopsy sleuth kit.	30%

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	or Perform forensic analysis through helix.	
	B) Study and document any two Forensic Tools (refer List Part 3 #11)	
IV - VIVA	VIVA	20%

- Following **is expected to be demonstrated**
  - Understanding of Basic Commands, Threats working
  - The execution of the Security Tools

Note: Some of the practicals form the above practical list may have seemingly similar definitions. For better learning and good practice, it is advised that students do maximum number of practicals. In the practical examination, the definition asked need not have the same wordings as given in the practical list. However, the definitions asked in the exams will be similar to the ones given in the practical list.