

**MIC/Vocational Courses (VOC) from the department for pool of the Courses
in the University**

**(All the departments will offer vocational courses for the students of same
or different departments.**

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	Cr ed its	MARKS				
			(Hrs)			Credits					TI	TE	PI	PE	Total
VOC-1	Front desk Management	242/MCA/ VO101	2	-	2	2	-	1	3	3	15	35	5	20	75

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	Cr ed its	MARKS				
			(Hrs)			Credits					TI	TE	PI	PE	Total
VOC-2	Animation and Graphic Design	242/MCA/ VO201	2	-	4	2	-	2	4	4	15	35	15	35	100

Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	Cr ed its	MARKS				
			(Hrs)			Credits					TI	TE	PI	PE	Total
VOC-3	Computer Hardware and Maintenance	242/MCA/ VO301	2	-	4	2	-	2	4	4	15	35	15	35	100

Semester 4

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	Cr ed its	MARKS				
			(Hrs)			Credits					TI	TE	PI	PE	Total
VOC-4	Digital Marketing	242/MCA/ VO401	2	-	4	2	-	2	4	4	15	35	15	35	100

Semester 5

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	Credits	MARKS				
			(Hrs)			Credits					TI	TE	PI	PE	Total
VOC-5	Mobile Application Development	242/MCA/VO501	2	-	4	2	-	2	4	4	15	35	15	35	100

Semester 6

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	Credits	MARKS				
			(Hrs)			Credits					TI	TE	PI	PE	Total
VOC-6	Data Handling and Visualization	242/MCA/VO601	2	-	4	2	-	2	4	4	15	35	15	35	100

Semester 7

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
VOC-7	Programming using 'R'	242/MCA/VO701	2	-	4	2	-	2	4	15	35	15	35	100

Semester 8

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
VOC-8	Digital Forensic	242/MCA/VO801	3	1	-	3	1	-	4	30	70	-	-	100

Course code				
Category	MIC/Vocational Courses (VOC)			
Course title	Front Desk Management			
Scheme and Credits	L	T	P	Credits
	2	0	2	3
Theory Internal	15			
Theory External	35			
Practical Internal	5			
Practical External	20			
Total	75			
Duration of Exam	3 HRS			

Note: The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no.2 to 9 will be of 20% of total marks of Question paper . The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Outcomes:

1. Develop, format, setup and print Word documents.
2. Learn advance features of Word Processing and use tables, comments and mail merge.
3. Create & format worksheets.
4. Create worksheets and handle databases using advanced features such as filters, pivot tables and cell locking.

UNIT-I

Word Processing Basics: Creating, Formatting and Editing a Word Document: Word Wrap, Spelling and Grammar

Check, Formatting Text and Paragraph, Paragraph Indents, Inserting and Formatting a Picture/ Clip Art in a Word

document, Smart Art, Wrap Text around Images, Adding Effect to Images, Inserting Symbols and Equations, Document,

Bullet and Numbered List, Find and Replace, Page Setup.

UNIT-II

Advance Features of Word Processing: Formatting Tables, Align Cell Text, Merge Cell, Text Directions, Adding a Chart

and Chart Styles, using and Making Templates, Mail- Merge, Add to Dictionary, Treasures, Character Map, Headers and

Footers, Page Numbering, Page Borders, Creating Columns, Creating and Dropping Comments, Watermark

UNIT-III

Excel Basics: About Ribbon Menus, Creating & Editing Worksheet, Use of Various Data Types, Text Orientation,

Formatting Spreadsheet: Cell Alignment and Border, Freeze Panes, Conditional Formatting, Using Formulas and

Functions, VLookup, Cell Referencing, Page Setup, Page Options, Customizing Margins, Headers and Footers, Print

Options, Print Formulas.

Unit – IV

Excel Advance Features: Transferring Data to and From Non Worksheet Files, Database Handling, Adding, Formatting

and Customising Chart, Change Chart Type, Sorting Data, Use of Filters, Data Analysis with Goal Seek and Scenario

Manager, Creating Scenario, Creating Pivot Tables, Using Slicers, Pivot Chart, Creating a Drop Down List, Locking

Cells, Using Multiple Workbooks.

Text Books:

1. Kevin Wilson, Essential Office 2016, pdfdrive.com
2. Microsoft Office- Complete Reference, BPB Publication.

3. Russell A. Stultz, Learn Microsoft Office, BPB Publication.

Reference Books:

1. Steven M. Freund, Mary Z. Last, Philip J. Pratt, Susan L. Sebok, Misty E. Vermaat, Jennifer T. Campbell, Mark

Frydenberg, Discovering Computers & Microsoft Office 365- A Fundamental Combined Approach, Cengage

Learning.

2. Courter, G Marquis, Microsoft Office 2000: Professional Edition, BPB.

3. Koers, D, Microsoft Office XP Fast and Easy, PHI.

4. Nelson, S L and Kelly J, Office XP: The Complete Reference, Tata McGraw-Hill

Course code				
Category	VOC			
Course title	ANIMATION AND GRAPHICS DESIGN			
Scheme and Credits	L	T	P	Credits
	2		1	3
TI	15			
TE	35			
PI	15			
PE	35			
Duration of Exam	3 HRS			

Course outcomes

At the end of this course, the student will be able to:

1. Have a knowledge of graphics applications and components and devices required to support the applications;
2. Develop algorithms for scan converting geometrical primitives such as lines, circles, ellipses, and curves along with algorithms for filling polygons, required for designing real-world applications;
3. Design algorithms for carrying out manipulations in pictures using geometric transformations, viewing transformations, and clipping operations;
4. Model 3-dimensional objects and apply viewing, visible –surface determination, and shading techniques to the models for achieving realism. The student will also learn to design and develop animation sequences.

Unit – I

Introduction to Computer Graphics and its Components: Overview of Computer Graphics, its functions &

elements; Introduction to GUI, Computer Vision, Augmented Reality and other Applications of Graphics;

Popular Graphics Software; Components and Working of Interactive Graphics; Raster Scan and Random Scan

systems and Display Processors; Look-up table; Loading the Frame Buffer; Coordinate Systems.

Graphics Devices: Display Technologies: Resolution, Aspect Ratio, Refresh CRT, Color CRT, Flat Panel Displays; Interactive Input Devices for Graphics, Image and Video Input Devices.

Unit – II

Scan Conversion: Drawing Geometry; Output Primitives; Lines and Pixel Graphics; AntiAliasing; Scan Converting Lines: DDA line drawing algorithms, Bresenham's line Algorithm; Scan Converting Circles: Polynomial method for circle drawing, circle drawing using polar coordinates, Bresenham's circle drawing;

Algorithms for Generation of ellipse; Line Styles; Generation of Bar Charts, Pie-Charts.

Curve Representation: Parametric Curves, Parametric Representation of a Circle, Parametric representation of cubic curves, drawing Bezier curves.

Unit – III

Two-Dimensional Transformations: Coordinate and Geometric Transformations; Translation, Rotation, Scaling; Matrix representations and Homogeneous coordinates, Composite transformations, General Pivot Point

rotation, General Fixed Point Scaling, Shearing; Reflection ; Reflection about an arbitrary line.

2-D Viewing: Viewing pipeline; Window, Viewport, Window-to-Viewport transformation; Zooming, Panning;

Pointing and Positioning techniques; Rubber band technique; Dragging.

Unit – IV

3-D Graphics & Modeling: Visualization techniques for Realism; 3D Object Representation; Solid Model Representation Schemes; Euclidean Geometry methods: Regularized Boolean Set Operations, Primitive Instancing, Boundary Representations, Curved lines and surfaces, Sweep Representations, Spatial-Partitioning

Representations - Octree representation, Constructive Solid Geometry; Procedural Methods: Fractals, Shape

Grammars, Particle systems, Physically Based modeling, Visualization techniques; 3D transformations.

Introduction to Animation: Designing of Animation Sequences; Key-Frame Systems; Animation Techniques:

Tweening, Morphing.

Text Books:

1. Donald Hearn, M. Pauline Baker, Computer Graphics, Pearson Education.
2. J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and Practice, Pearson Education.

Reference Books:

1. Newmann & Sproull, Principles of Interactive Computer Graphics, McGraw Hill.
2. Rogers, David F., Procedural Elements of Computer Graphics, McGraw Hill.
3. Zhigang Xiang, Roy Plastock, Computer Graphics, Tata McGraw Hill.
4. Malay K. Pakhira, Computer Graphics, Multimedia and Animation, PHI

LAB: List of Experiments

List of Experiments:

1. Study of Fundamental Graphics Functions.
2. Implementation of Line drawing algorithms: DDA Algorithm, Bresenham's Algorithm
3. Implementation of Circle drawing algorithms: Bresenham's Algorithm, Mid-Point Algorithm.
4. Programs on 2D and 3D transformations
5. Write a program to implement Cohen Sutherland line clipping algorithm
6. Write a program to draw Bezier curve.
7. Using Flash/Maya perform different operations (rotation, scaling move etc..) on objects
8. Create a Bouncing Ball using Key frame animation and Path animation.
- 9 Write a program for making Bezier curve.
- 10 Write a program to study various in build functions for 2D drawing in MAYA

software.

11 Write a program to show animation of a ball moving in a helical path.

12. Write a program to show animation of solar system.

Course code				
Category	VOC			
Course title	Computer Hardware and Maintenance			
Scheme and Credits	L	T	P	Credits
	3		2	4
TI	15			
TE	35			
PI	15			
PE	35			
Duration of Exam				

NOTE: “The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no.2 to 9 will be of 20% of total marks of Question paper . The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.”

Course outcomes:

- 1.It will understand the basics of computer systems along with peripherals.
- 2.It will be able to do troubleshooting of different computer related issues.
- 3.It will learn to determine and installing appropriate security measures.
4. Students will be able provide the technical support on-site
5. Students will be able to troubleshoot software and hardware problems related to internet applications

UNIT-I

INTRODUCTION TO PERIPHERAL DEVICES: General block diagram of a peripheral device, different types of peripheral devices used in modern computers and their purpose .

UNIT-II

BASIC INPUT & OUTPUT DEVICES : INPUT DEVICES: Block diagram of keyboard, different types of keyboards, operation and working principle of mouse and different mouse. OUTPUT DEVICES: Construction of CRT Monitor. Impact and non impact printers, operation of LaserJet printer with a block diagram, operation of inkjet printer with a block diagram

UNIT-III

BASIC STORAGE DEVICES & SPECIAL PERIPHERAL DEVICES: BASIC STORAGE DEVICES: Construction of floppy disk with a block diagram, construction of a hard disk with a block diagram, precautions to be taken in handling magnetic media. SPECIAL PERIPHERAL DEVICES: Principle and working of a joystick and digitizer, operation of a plotter, various parts of magnetic tape transport

UNIT-IV

BASIC TROUBLE SHOOTING: Various test equipments used for PC servicing, reasons for failure of components like resistors, capacitors etc. reasons for failure of a disk drive, reasons for display failure, reason for the keyboard failure, reasons for the printer failure, reasons for the power supply failure, safety precautions to be taken during trouble shooting.

LAB : List of Programs

1 Front panel indicators & switches and Front side & rear side

Connectors.

2 Familiarize the computer system Layout: Marking positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards.

3 Configure BIOS setup program and troubleshoot the typical problems using BIOS utility.

4 Install Hard Disk and configure to the Pc's

5 Install and Configure a DVD Writer and a Blu-ray Disc writer and recording DVD and Blu-ray disk.

6 Printer Installation and Servicing and troubleshoot

7 Install and configure Scanner, Web cam, Cell phone and bio-metric

device with system and troubleshoot the problems

8 Assemble a system with add on cards and check the working condition of the system and install OS.

9 Install and Configure Dual OS Installation

10 Assembling and Disassembling of Laptop to identify the parts and to install OS and configure it.

Course code				
Category	Vocational Course (VOC)			
Course title	Digital Marketing			
Scheme and Credits	L	T	P	Credits
	2	-	2	4
Theory Internal	15			
Theory External	30			
Practical Internal	15			
Practical External	35			
Total	100			
Duration of Exam	3 hrs			

Note: The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no.2 to 9 will be of 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course outcomes:

CO1: Understand the concept of digital marketing and its real-world iterations

CO2: Articulate innovative insights of digital marketing enabling a competitive edge

CO3: Understand how to create and run digital media based campaigns

CO4: Identify and utilise various tools such as social media etc.

Unit-I

Introduction to Digital Marketing Evolution of Digital Marketing from traditional to modern era, Role of Internet; Current trends, Info-graphics, implications for business & society; Emergence of digital marketing as a tool; Drivers of the new marketing environment; Digital marketing strategy; P.O.E.M. framework, Digital landscape, Digital marketing plan, Digital marketing models.

Unit-II

Internet Marketing and Digital Marketing Mix – Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on IMC; Search Engine Advertising: - Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation Display marketing: - Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing.

Unit-III

Social Media Marketing – Role of Influencer Marketing, Tools & Plan– Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy Facebook Marketing: - Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools LinkedIn Marketing: - Introduction and Importance of LinkedIn Marketing, Framing LinkedIn Strategy, Lead Generation through LinkedIn, Content Strategy, Analytics and Targeting Twitter Marketing: - Introduction to Twitter Marketing, how twitter Marketing is different than other forms of digital marketing, framing content strategy, Twitter Advertising Campaigns Instagram and Snapchat: - Digital Marketing Strategies through Instagram and Snapchat Mobile Marketing: - Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics Introduction to social media metrics

Unit-IV

Introduction to SEO, SEM, Web Analytics, Mobile Marketing, Trends in Digital Advertising– - Introduction and need for SEO, How to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics - Introduction to SEM Web Analytics: - Google Analytics & Google AdWords; data collection for web analytics, multichannel attribution, Universal analytics, Tracking code Trends in digital advertising.

Digital Marketing Lab List of Experiments

1. Digital Marketing Implementation in Business Scenario
2. Create the Digital Marketing Webpage
3. Conducting the Search Engine Optimization and Search Engine Marketing
4. Using Google Analytics to analyze website performance
5. Creating Promotional banner through Canva
6. Facebook Promotion using banners
7. Creating YouTube Channel for Marketing
8. Twitter Marketing
9. Instagram Marketing
10. Email Marketing Additional 11 Digital Marketing Final Analysis and Report

Course code				
Category	Vocational Course (VOC)			
Course title	Mobile Application Development			
Scheme and Credits	L	T	P	Credits
	2	-	2	4
Theory Internal	15			
Theory External	35			
Practical Internal	15			
Practical External	35			
Total	100			
Duration of Exam	3 hrs			

Note: The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no.2 to 9 will be of 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course outcomes:

- CO1. Identify various concepts of mobile programming that make it unique from programming for other platforms,
- CO2. Critique mobile applications on their design pros and cons,
- CO3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
- CO4. Program mobile applications for the Android operating system that use basic and advanced phone features, and
- CO5. Deploy applications to the Android marketplace for distribution.

UNIT-I

Introduction to Android - Installing Android Studio, Layouts, Views and Resources, Scrolling Views, Working with TextView Elements. Activities and Intents - Create and Start Activities, Lifecycle and State Callbacks, Testing and Debugging, and Backwards Compatibility: Debugging and Testing app, Support libraries.

UNIT-II

User Interaction and Navigation - User Input Controls: Use Keyboards, Input Controls, Alerts, and Pickers, Menus and Radio Buttons, Screen Navigation. Themes and Styles: Theme, Custom Styles, Drawables.

UNIT-III

Connect to the Internet -Google APIs Explorer, JSON, Use AsyncTaskLoader, Triggering, Scheduling, and Optimizing, Background Tasks: Alarm Manager.

UNIT- IV

Data Saving, Retrieving, Loading - Storing Data using SQLite, Sharing Data: Implement a Content Provider, Loading Data using Loaders, Publishing app: Permissions and Libraries, Making and publishing APKs.

Reference books / web links:

1. Jeff Mewherter, Scott Gowell, 'Professional Mobile Application Development', 1st Edn., Wrox Publisher.
2. Lauren Darcy and Shane Conder 'Teach Yourself Android Application Development in 24 Hrs', 1st Edn., Sams publications.
3. Himanshu Dwivedi, Chris Clark, David Thiel, 'Mobile Application Security', 1st Edn., Tata McGraw Hill.

Course code				
Category	Vocational Course			
Course title	Data Handling and Visualization			
Scheme and Credits	L	T	P	Credits
	2	-	2	4
Theory Internal	25			
Theory External	50			
Practical Internal	05			
Practical External	20			
Total	100			
Duration of Exam	3 hrs			

Note: The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no.2 to 9 will be of 20% of total marks of Question paper. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course outcomes:

- CO1. Use data analysis tools in the pandas library.
- CO2. Load, clean, transform, merge and reshape data.
- CO3. Create informative visualization and summarize data sets.
- CO4. Analyze and manipulate time series data.
- CO5. Solve real world data analysis problems.

Unit I:

Value of Visualization – What is Visualization and Why do it: External representation – Interactivity – Difficulty in Validation. Data Abstraction: Dataset types – Attribute types – Semantics. Task Abstraction – Analyze, Produce, Search, Query. Four levels of validation – Validation approaches – Validation examples. Marks and Channels

Unit II:

Rules of thumb – Arrange tables: Categorical regions – Spatial axis orientation – Spatial layout density. Arrange spatial data: Geometry – Scalar fields – Vector fields – Tensor fields. Arrange networks and trees: Connections, Matrix views – Containment. Map color: Color theory, Color maps and other channels.

Unit III:

Manipulate view: Change view over time – Select elements – Changing viewpoint – Reducing attributes.

Unit IV

Facet into multiple views: Juxtapose and Coordinate views – Partition into views – Static and Dynamic layers – Reduce items and attributes: Filter – Aggregate. Focus and context: Elide – Superimpose – Distort

Data handling and Visualization Lab List of Experiments

1. Introduction to various Data Visualization tools
2. Basic Visualization in Python
3. Basic Visualization in R
4. Introduction to Tableau and Installation
5. Connecting to Data and preparing data for visualization in Tableau
6. Data Aggregation and Statistical functions in Tableau
7. Data Visualizations in Tableau
8. Basic Dashboards in Tableau

Programming using 'R'

Course code	7.6			
Category	Vocational Course (VOC)			
Course title	Programming using 'R'			
Scheme and Credits	L	T	P	Credits
	2	-	4	4
Theory Internal	25			
Theory External	50			
Practical Internal	05			
Practical External	20			
Total	100			
Duration of Exam	3 hrs.			

Note: Examiner will be required to set NINE questions with all questions carrying equal marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner will set two questions from each Unit with internal choice. Student will be required to attempt FIVE questions in all, selection one question from every unit apart from the Question Number 1.

COURSE OUTCOMES:

CO1. Learn Fundamentals of R.

CO2. Covers how to use different functions in R, how to read data into R, accessing R packages, writing, R functions, debugging, and organizing data using R functions.

CO3. Cover the Basics of statistical data analysis with examples.

CO4. To apply mathematical and statistical operations data structures in R.

CO5. To explain critical R programming language concepts such as control structures and recursion.

UNIT I

Introduction to R: What is R? – Why R? – Advantages of R over Other Programming Languages- R Studio: R command Prompt, R script file, comments.

Handling Packages in R: Installing a R Package, Few commands to get started: installed. Packages (), package. Description (), help (), find. Package (), library () - Input and Output – Entering Data from keyboard.

R - Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame.

R - Variables: Variable assignment, Data types of Variable, Finding Variable ls (), Deleting Variables

UNIT II

R - Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators.

R - Decision Making: if statement, if – else statement, if – else if statement, switch statement.

R - Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.

R - Function: function definition, Built-in functions: mean (), paste (), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values.

UNIT III

R – Strings: Manipulating Text in Data: substr (), strsplit(), paste(), grep(), toupper(), tolower().

R – Vectors: Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting.

R – List: Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector.

R – Matrices: Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division.

R - Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements.

R – Factors: creating factors, generating factor levels gl().

R - Data Frames: Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, **Expand Data Frame:** Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast().

UNIT IV

Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.

Data Visualization through various plots and charts: bar charts, histogram, frequency polygon, density plots, scatter plots, box & whisker plots, heat and contour plots, plotting the above graphs in R, plotting with package ggplot2.

TEXT AND REFERENCE BOOKS:

1. W. N. Venables, D. M. Smith and the R core Team, An introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics, version 3.3.2, 2016.
2. Saroj Dahiya Ratnoo and Himmat Singh Ratnoo, Essentials of R for Data Analytics, Wiley, 2021.
3. Hadley Wickham and Garrett Grolemund, R for Data Science Import, Tidy, Transform and model Data, O'Reilly, 2017.
4. Paul Teeter, R Cookbook, O'Reilly, 2011.
5. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning with Applications in R, Springer, 2013. Han, J., Kamber, M, Pei, J., Data Mining Concepts and Techniques, Third edition, Morgan Kaufmann, 2012.

R PROGRAMMING LAB

1. Write a R program to take input from the user (name and age) and display the values.
2. Write a R program to get the details of the objects in memory.
3. Creating a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
4. Creating a simple bar plot of five subjects marks.
5. Get the unique elements of a string and unique numbers of vectors
6. Appending value to a given empty vector
7. Multiplying two vectors of integer type and length 3
8. Find the sum, mean and product of a vector, ignoring elements like NA and NaN.
9. To create three vectors a,b,c with 3 integers. Combine three vectors to become a 3*3 matrix where each column represents a vector. Print the content of the matrix
10. Program to create a matrix from a list of given vectors

Digital Forensic

Course code	7.6			
Category	Vocational Course (VOC)			
Course title	Digital Forensic			
Scheme and Credits	L	T	P	Credits
	3	-	2	4
Theory Internal	25			
Theory External	50			
Practical Internal	05			
Practical External	20			
Total	100			
Duration of Exam	3 hrs.			

Note: Examiner will be required to set NINE questions with all questions carrying equal marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner will set two questions from each Unit with internal choice. Student will be required to attempt FIVE questions in all, selection one question from every unit apart from the Question Number 1.

Unit -I: Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues. Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

Unit-II: Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

Unit-III: Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

Unit-IV: Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

TEXT AND REFERENCE BOOKS:

1. Warren G. Kruse II and Jay G. Heiser, “Computer Forensics: Incident Response Essentials”, Addison Wesley, 2002.

2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.