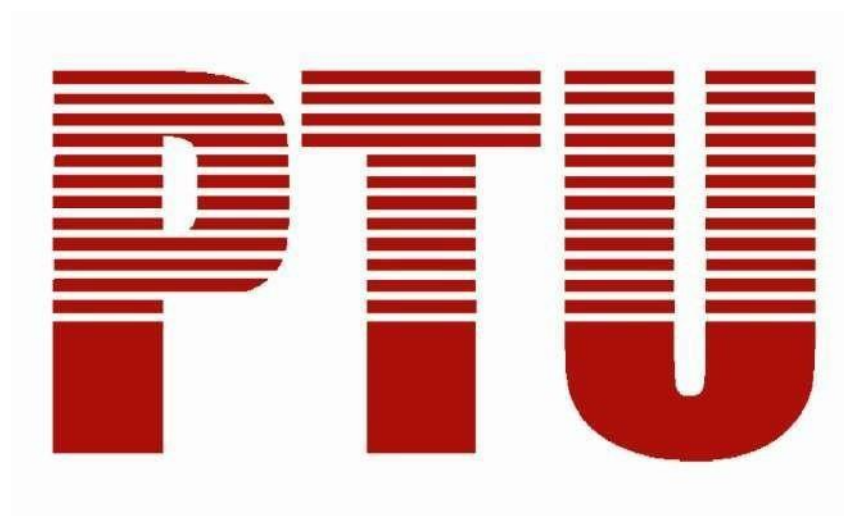


**Scheme & Syllabus of**  
**Bachelor of Vocational Studies**  
**(B. Voc.)**  
**Data & Web Analytics**

**Batch 2021**



By Department of Academics  
**IKG Punjab Technical University**

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

**Semester 1<sup>st</sup>**

Course Code	Course Title	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BVDW101-21	Introduction to Internet & MS-Office	3	0	40	60	100	3
BVDW102-21	Programming Fundamentals in C++	3	0	40	60	100	3
BVDW103-21	Communicative English	3	0	40	60	100	3
BVDW104-21	Basic IT Skills	3	0	40	60	100	3
BVDW105-21	Introduction to Internet & MS-Office Laboratory	0	3	30	20	50	1.5
BVDW106-21	Programming Fundamentals in C++ Laboratory	0	3	30	20	50	1.5
<b>On-Job Training / Qualification Pack*</b>							
BVDW107-21	Test Engineer (SSC/Q1301)	On Job Training (OJT) in Collaboration with MoU industry			200	200	15
<b>Total</b>		<b>12</b>	<b>6</b>	<b>220</b>	<b>480</b>	<b>700</b>	<b>30</b>

\*The qualification packs may vary from institute to institute.

**Semester 2<sup>nd</sup>**

Course Code	Course Title	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BVDW201-21	Database Management Systems	3	0	40	60	100	3
BVDW202-21	Internet Tools and Applications	3	0	40	60	100	3
BVDW203-21	Computer Architecture	3	0	40	60	100	3
BVDW204-21	Mathematics	3	0	40	60	100	3
BVDW205-21	Database Management Systems Laboratory	0	3	30	20	50	1.5
BVDW206-21	Internet Tools and Applications lab	0	3	30	20	50	1.5
<b>On-Job Training / Qualification Pack*</b>							
BVDW207-21	Web Developer (SSC/Q0503)	On Job Training (OJT) in Collaboration with MoU industry			200	200	15
<b>Total</b>		<b>12</b>	<b>6</b>	<b>220</b>	<b>480</b>	<b>700</b>	<b>30</b>

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

**Semester 3<sup>rd</sup>**

Course Code	Course Title	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BVDW301-21	Programming with Python	3	0	40	60	100	3
BVDW302-21	Introduction to Big Data	3	0	40	60	100	3
BVDW303-21	Computer Fundamentals	3	0	40	60	100	3
BVDW304-21	Advanced HTML & Java Script	3	0	40	60	100	3
BVDW305-21	Programming with Python Lab	0	2	30	20	50	1
BVDW306-21	Advanced HTML & Java Script Lab	0	2	30	20	50	1
BVDW307-21	Introduction to Big Data Lab	0	2	30	20	50	1
<b>On-Job Training / Qualification Pack*</b>							
BVDW308-21	Junior Software Developer (SSC/Q0508)	On Job Training (OJT) in Collaboration with MoU industry		200	200	200	15
<b>Total</b>		<b>12</b>	<b>6</b>	<b>250</b>	<b>500</b>	<b>750</b>	<b>30</b>

**Semester 4<sup>th</sup>**

Course Code	Course Title	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BVDW401-21	Data Warehouse & Data Mining	3	0	40	60	100	3
BVDW402-21	Data Analytics using R	3	0	40	60	100	3
BVDW403-21	Data Structures	3	0	40	60	100	3
BVDW404-21	Digital Marketing	3	0	40	60	100	3
BVDW405-21	Data Analytics using R Lab	0	3	30	20	50	1.5
BVDW406-21	Data Structures Lab	0	3	30	20	50	1.5
<b>On-Job Training / Qualification Pack*</b>							
BVDW407-21	On Job Training with MoU Industry based of data Analytics or Digital Marketing.			200	200	200	15
<b>Total</b>		<b>12</b>	<b>6</b>	<b>220</b>	<b>480</b>	<b>700</b>	<b>30</b>

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: BVDW101-21

Course Name: **Introduction to Internet & MS-Office**

Program: <b>B. Voc.</b>	L: 3 T: 0 P: 0
Branch: <b>Data &amp; Web Analytics</b>	Credits: 3
Semester: <b>1<sup>st</sup></b>	Contact hours: 33
Theory/Laboratory: <b>Theory</b>	Status (Elective/Core): <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	To develop an understanding & practical exposure to MS Office used as business tool.
CO2	To equip the students with the relevant skills and working knowledge of various office management tools
CO3	To develop an understanding of the practices and technology required for the Internet.

Detailed contents	Contact hours
<b>Unit 1:</b> Introduction: About internet and its working, business use of internet, services. Internet Protocol: Introduction, file transfer protocol (FTP), Gopher, Telnet, other protocols like HTTP and TCPIP. WWW: Introduction, working of WWW, Web browsing (opening, viewing, saving and printing a web page and bookmark)	9
<b>Unit 2:</b> Microsoft Word: Interface, Toolbar, Working with a document (Create, open, Save, Export etc.), Working with text, Images and Tables, Page layout (Headers and footers, Margins, Page and line numbers), Mail Merge, Automating tasks (Smart documents, Macros), File formats and Export features.	8
<b>Unit 3:</b> MS-Excel: Introduction, Components of Excel History, Creating, Saving, Opening, Spreadsheet, Formatting numbers and Text, Graph and Chart Formatting Commands, Menu Bar, Toolbars, Producing Charges, Protecting Cell Macro and Printing Operation, Spell Checking, Cell Editing, Calculation of various Financial and Statistical Functions using Formulas.	8
<b>Unit 4:</b> Microsoft Power Point: Interface, Working with a document (Create, open, Save, Export etc.), Creating and editing power point presentations (Slideshows, Animations, Transitions, graphics and charts), File formats and Export features.	8

**Text Books:**

1. Understanding The Internet by Kieth Sutherland, Butterworth-Heinemann.
2. Internet Technologies by S. K. Bansal, APH Publishing Corporation.
3. MS-Office 2007 Training Guide by S. Jain, BPB Publication.

**Reference Books:**

1. Computer Basics and Beyond by Michael A. Price.
2. MS-Office 2007 for Dummies by Wallace Wang, Wiley Publishing Inc.
3. Fundamentals of Computers. Delhi: Prentice-Hall.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

**Course Code: BVDW102-21**

Course Name: **Programming Fundamentals in C++**

Program: <b>B. Voc.</b>	L: 3 T: 0 P: 0
Branch: <b>Data &amp; Web Analytics</b>	Credits: 3
Semester: <b>1<sup>st</sup></b>	Contact hours: 33
Theory/Laboratory: <b>Theory</b>	Status (Elective/Core): <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	To learn programming from real world examples.
CO2	To understand Object oriented approach for finding Solutions to various problems with the help of C++ language.
CO3	To create computer based solutions to various real-world problems using C++.
CO4	To learn various concepts of object oriented approach towards problem solving.

Detailed contents	Contact hours
<b>Unit 1:</b> Fundamentals: Character set, Identifiers and Key Words, Data types, Constants, Variables, Expressions, Statements, Symbolic Constants. Operations and Expressions: Arithmetic operators, Unary operators, Relational Operators, Logical Operators, Assignment and Conditional Operators. Data Input and Output: single character Input, single character output, entering input data, writing output data.	9
<b>Unit 2:</b> Control Statements: Preliminaries, While, Do-while and For statements, Nested loops, If- else, Switch, Break – Continue statements. Functions: Declaring and defining function, Local, global variables, Passing argument to function, Reference arguments, Overloading functions.	8
<b>Unit 3:</b> Object Oriented Programming: Objects & Classes, Constructor & Destructor, Operator overloading, Overloading unary operators, Overloading binary operators, Data conversion, Pitfalls operator overloading and conversion.	8
<b>Unit 4:</b> Inheritance: Derived class and Base Class, Derived Class Constructors, Overriding member functions, Inheritance in the English distances class, class hierarchies, Public and Private inheritance, Level of inheritance. Polymorphism: Problems with single inheritance, Multiple inheritance.	8

**Text Books:**

1. Object Oriented Programming with C++, E. Balagurusami, 4<sup>th</sup> Edition, TMG.
2. Object Oriented Progg. in Turbo C++, Robert Lafore, 4<sup>th</sup> Edition Galgotia Publications.

**Reference Books:**

1. Computer Basics and Beyond by Michael A. Price.
2. Mastering C++ by K R Venugopal and Raj Kumar Buyya.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW103-19**

Course Name: **Communicative English**

Program: <b>B. Voc.</b>	L: <b>3</b> T: 0 P: 0
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>3</b>
Semester: <b>1<sup>st</sup></b>	Contact hours: <b>33</b>
Theory/Laboratory: <b>Theory</b>	Elective status: <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	To introduce students to the theory, fundamentals and tools of communication.
CO2	To help the students become the independent users of English language.
CO3	To develop vital communication skills integral to their personal, social and professional interactions.
CO4	The syllabus shall address the issues relating to the Language of communication.
CO5	Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills and writing skills.

Detailed contents	Contact hours
Unit1- 1 (Introduction) <ul style="list-style-type: none"> <li>• Theory of Communication,</li> <li>• Types and modes of Communication</li> </ul>	9
Unit- 2 (Language of Communication) <ul style="list-style-type: none"> <li>• Verbal and Non-verbal</li> <li>• (Spoken and Written)</li> <li>• Personal, Social and Business</li> <li>• Barriers and Strategies</li> <li>• Intra-personal, Inter-personal and Group communication</li> </ul>	8
Unit-3 (Reading and Understanding) <ul style="list-style-type: none"> <li>• Close Reading</li> <li>• Comprehension</li> <li>• Summary Paraphrasing</li> <li>• Analysis and Interpretation</li> <li>• Translation(from Hindi/Punjabi to English and vice-versa</li> <li>• Literary/Knowledge Texts</li> </ul>	8
Unit-4 (Writing Skills) <ul style="list-style-type: none"> <li>• Documenting</li> <li>• Report Writing</li> <li>• Making notes</li> <li>• Letter writing</li> </ul>	8

**Text Books:**

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.

**Reference Books:**

1. Practical English Usage by Michael Swan. OUP. 1995.
2. Communication Skills by Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW104-19**

Course Name: **Basic IT Skill**

Program: <b>B. Voc.</b>	L: <b>3</b> T: <b>0</b> P: <b>0</b>
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>3</b>
Semester: <b>1<sup>st</sup></b>	Contact hours: <b>33</b>
Theory/Laboratory: <b>Theory</b>	Elective status: <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	Understanding the concept of input and output devices of Computers.
CO2	Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices.
CO3	Learn basic word processing, Spreadsheet and Presentation Graphics Software skills.
CO4	Study to use the Internet safely, legally, and responsibly.
CO5	To develop an understanding and practical exposure to different IT tools used as an aid in business and ecommerce.

Detailed contents	Contact hours
<p><b>Unit 1 :</b>  Human Computer Interface, Concepts of Hardware and Software; Data and Information.  Functional Units of Computer System: CPU, registers, system bus, main memory unit, cache memory, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.  Devices: Input and output devices, keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter.  Memory: Primary, secondary.</p>	9
<p><b>Unit 2:</b>  Types of Languages: Machine, assembly and High level Language; Operating system as user interface, utility programs.  Word processing: Editing features, formatting features, saving, printing, table handling, page settings, spell-checking, macros, mail-merge, equation editors.</p>	8
<p><b>Unit 3:</b>  Spreadsheet: Workbook, worksheets, data types, operators, cell formats, freeze panes, editing features, formatting features, creating formulas, using formulas, cell references, replication, sorting, filtering, functions, Charts &amp; Graphs.  Presentation Graphics Software: Templates, views, formatting slide, slides with graphs, animation, using special features, presenting slide shows.</p>	8
<p><b>Unit 4:</b>  The Impact of Computing and the Internet on Society.  Electronic Payment System: Secure Electronic Transaction, Types of Payment System: Digital Cash, Electronic Cheque, Smart Card, Credit/Debit Card E-Money, Immediate Payment System (IMPS).</p>	8

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

**Text Books:**

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. Computer Fundamentals, A. Goel, 2010, Pearson Education.
3. Fundamentals of Computers, P. K.Sinha& P. Sinha, 2007, BPB Publishers.

**Reference Books:**

1. Introduction to Computers by Peter Norton.
2. Computers Today by D. H. Sanders, McGraw Hill.
3. Computers by Larry long & Nancy long, 12<sup>th</sup> edition, Prentice Hall.



**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW105-19**

Course Name: **Introduction to Internet & MS-Office Laboratory**

Program: <b>B.Voc</b>	L: 0 T: 0 P: 3
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>1.5</b>
Semester: <b>1<sup>st</sup></b>	
Theory/Laboratory : <b>Laboratory</b>	Percentage of numerical/design problems:-
Internal max. marks: <b>30</b>	Duration of end semester exam (ESE):-
External max. marks: <b>20</b>	Status (Elective/Core): <b>Core</b>
Total marks: <b>50</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	Familiarizing with Open Office (Word processing, Spreadsheets and Presentation).
CO2	To acquire knowledge on editor, spread sheet and presentation software.
CO3	The students will be able to perform documentation and accounting operations.
CO4	Students can learn how to perform presentation skills.

<b>Task 1:</b>	Microsoft Word: To familiarize with parts of Word, to create and save a document, to set page settings, create headers and footers, to edit a document and resave it, to use copy, cut and paste features, to use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc. To use spelling and grammar checking feature, to preview print a document. To create a table with specified rows and columns, to enter data in a table, to select a table, a row, a column or a cell, to inset new row and/or a column, to delete a row and/or a column, to split and merge a row, column or a cell. To understand the mail-merge and to use mail merge feature of MS-Word.
<b>Task 2:</b>	Microsoft Excel: To familiarize with parts of Excel window, to create and save a workbook with single and/or multiple worksheets, to edit and format text as well numbers, to apply operations on range of cells using built-in formulae, to preview and print a worksheet, to insert new row and/or column in a worksheet, to delete a row and/or column in a worksheet, to create a variety of charts, to import and export data to or from worksheet.
<b>Task 3:</b>	Microsoft PowerPoint: To familiarize with parts of PowerPoint, to create and save a new presentation, to apply design templates to a presentation, to insert, edit and delete a slide, to use different views of slides, to use slide show from beginning or from the current slide, to preview and print a presentation, to check spellings in a presentation, to add clip art and pictures in a slide, to add chart, diagram and table in a slide, to set animation for a selected slide and/or for entire presentation, to create slide master and title master, to create a custom show.

**Recommended Hardware & Software:**

Intel Core i-3 / i-5 / i-7 processor with a speed of minimum 2 GHz, RAM 2 GB or higher, HDD 200 GB or higher, LED / LCD screen and Microsoft MS Office 2003 / XP / 2007

**Test Books:**

1. IT Tools, R.K. Jain, Khanna Publishing House.
2. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW106-19**

Course Name: **Programming Fundamentals in C++ Laboratory**

Program: <b>B. Voc.</b>	L: 0 T: 0 P: 3
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>1.5</b>
Semester: <b>1<sup>st</sup></b>	Percentage of numerical/design problems:-
Theory/Laboratory: <b>Laboratory</b>	Duration of end semester exam (ESE):-
Internal max. marks: <b>30</b>	External max. marks: <b>20</b>
Total marks: <b>50</b>	Status (Elective/Core): <b>Core</b>

**Course Outcomes:**

CO#	Course outcomes
CO1	To learn programming from real world examples.
CO2	To understand Object oriented approach for finding Solutions to various problems with the help of C++ language.
CO3	To create computer based solutions to various real-world problems using C++.
CO4	To learn various concepts of object oriented approach towards problem solving.

<b>Task 1 :</b>	Write a program to enter mark of 6 different subjects and find out the total mark (Using cin and cout statement).
<b>Task 2 :</b>	Write a function using reference variables as arguments to swap the values of pair of integers.
<b>Task 3 :</b>	Write a function to find largest of three numbers.
<b>Task 4 :</b>	Write a program to find the factorial of a number.
<b>Task 5 :</b>	Define a class to represent a bank account which includes the following members as Data members: a) Name of the depositor b) Account Number c) Withdrawal amount d) Balance amount in the account Member Functions: e) To assign initial values: i. To deposit an amount, ii. To withdraw an amount after checking the balance & iii. To display name and balance.
<b>Task 6 :</b>	Write a program for single inheritance.
<b>Task 7 :</b>	Write a program for use of constructor and destructors.
<b>Task 8 :</b>	Write a program for Multiple inheritances.
<b>Task 9 :</b>	Write a program for Multilevel inheritance
<b>Task 10 :</b>	Write a program for file handling.

**Recommended Hardware & Software:**

Intel Core i-3 / i-5 / i-7 processor with a speed of minimum 2 GHz, RAM 2 GB or higher, HDD 200 GB or higher, LED / LCD screen and Borland C++ / Turbo C++

**Text Books:**

1. The C++ Programming Language, BjarnaStroustrup, Third Edition, AddisonWesley Publishing Company.
2. Object Oriented Programming Using C++, Salaria, R. S, Fourth Edition, Khanna Book Publishing.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW201-19**

Course Name: **Database Management Systems**

Program: <b>B. Voc.</b>	L: <b>3</b> T: 0 P: 0
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>3</b>
Semester: <b>2<sup>nd</sup></b>	Contact hours: <b>33</b>
Theory/Laboratory: <b>Theory</b>	Status (Elective/Core): <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	Understand the basic concepts of DBMS.
CO2	Formulate, using SQL, solutions to a broad range of query and data update problems.
CO3	Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
CO4	Understand the concept of Transaction and Query processing in DBMS.

Detailed Contents	Contact hours
<b>Unit-I:</b> Introduction of DBMS, Data Modeling for a Database, Three level Architecture of DBMS, Components of a DBMS. Introduction to Data Models, Hierarchical, Network and Relational Model, Comparison of Network, Hierarchical, Relational & Entity Relationship Model.	9
<b>Unit-II</b> Relational Database, Relational Algebra and Calculus, SQL Fundamentals, DDL, DML, DCL, PL/SQL Concepts, Cursors, Stored Procedures, Stored Functions, Database Triggers.	8
<b>Unit-III</b> Introduction to Normalization, First, Second, Third Normal Forms, Dependency Preservation, Boyce-Codd Normal Form, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Domain-key normal form (DKNF).	8
<b>Unit-IV</b> Database Recovery, Concurrency Management, Database Security, Integrity and Control. Structure & Design of a Distributed Database.	8

**Text Books:**

1. An Introduction to Database System by Bipin C. Desai, Galgotia Publications Pvt Ltd-New Delhi, Revised Edition, (2012).
2. An Introduction to Database Systems by C. J. Date, A. Kannan & S. Swamynathan, 8<sup>th</sup> Edition, Pearson Education, (2006).

**Reference Books:**

1. SQL, PL/SQL The Programming Language of Oracle”, Ivan Bayross, BPB Publications, 4<sup>th</sup> Revised Edition (2009).
2. Database System Concepts by Abraham Silberschatz, Henry F. Korth & S. Sudharshan, Tata McGraw Hill, 6<sup>th</sup> Edition, (2013).
3. Database Management Systems, Raghuram Krishnan, McGraw-Hill, 3<sup>rd</sup> Edition, 2014.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW202-19**

Course Name: **Internet Tools & Applications**

Program: <b>B. Voc.</b>	L: <b>3</b> T: <b>0</b> P: <b>0</b>
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>3</b>
Semester: <b>2<sup>nd</sup></b>	Contact hours: <b>33</b>
Theory/Laboratory: <b>Theory</b>	Status (Elective/Core): <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Course Outcomes:** Students will be able to

<b>CO#</b>	<b>Course outcomes</b>
CO1	Understand basic concepts of Internet.
CO2	Design a web page.
CO3	Understand various applications of Internet .

<b>Detailed contents</b>	<b>Contact hours</b>
<p><b>Unit-I</b></p> <p><b>Internet:</b> Internet, its advantages, disadvantages, internet facilities through WWW and HTML, Internet Protocols, TCP/IP, FTP, newsgroups, remote logins, chat groups etc.</p>	2 hours
<p><b>Unit-II</b></p> <p><b>WWW:</b> Client side, Server side, web browsers, web pages, locating information on the web.</p> <p><b>E-Mail:</b> Architecture, various aspects, the user agent, message format, message transfer, e-mail privacy.</p> <p><b>Domain Name Server and its working</b></p>	3 hours
<p><b>Unit-III</b></p> <p><b>HTML:</b> Introduction to HTML, Web structure of HTML document.</p> <p><b>Starting an HTML document:</b> Head element, body element, style element, Script element, Text formatting, using lists to organize information.</p> <p><b>Organizing Data with Table:</b> Basic table Structures, individual cells and headings, vertical controls, database considerations, displaying real data with a table.</p>	3 hours

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**B. Voc. (Data & Web Analytics), Batch-2021**

<b>Table Layout and Presentation:</b> Table Syntax, two column layout, staggered body with an index, traditional newspaper layout.	
<b>Unit-IV</b> <b>Uniform Resource Locators (URLs):</b> Absolute URLs, Relative URLs, fragment URLs, Types of URL Schemes- HTTP, mailto, news, FTP, Telnet, File etc. <b>Using Hyper Links and Anchors:</b> Uses to Hyper Links, Structure of Hyper Links, Links to specialized contents. <b>Images:</b> Adding Images to web page, using images as links, creating menus with image maps, image formats-GIF, JPEG etc.	3 hours

**Text Books:**

1. Corner, Internetworking with TCP-IP: Principles, Protocols and Architecture, PHI.
2. Stephan Mack, Janan Platt, HTML 4.0 No Experience Required, BPB Publication.
3. Rick Darnell et al, HTML 4 Unleashed, Tech media Publications.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW203-21**

Course Name: **Computer Architecture**

Program: <b>B. Voc.</b>	L: <b>3</b> T: <b>0</b> P: <b>0</b>
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>3</b>
Semester: <b>2<sup>nd</sup></b>	Contact hours: <b>33</b>
Theory/Laboratory: <b>Theory</b>	Status (Elective/Core): <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	To know about the basic functioning of various parts of computer system from hardware point of view and interfacing of various peripheral devices used with the system.
CO2	To learn number system and various types of micro-operations of processor.
CO3	To learn the communication of various components through common bus.
CO4	To learn how to design Combinational & Sequential circuits.

Detailed Contents	Contact hours
<b>Unit-I</b> <b>Logic Gates:</b> AND, OR, NOT, NAND, NOR, XOR, XNOR, NAND & NOR as Universal Gates, Logic Gates Applications. <b>Boolean Algebra:</b> Introduction, Theorems, Simplification of Boolean Expression using Boolean Algebra, SOP & POS Forms, Realization of Boolean Expression using Gates, K-Maps, Simplification of Boolean Expression using K-Maps.	9
<b>Unit-II</b> <b>Combinational Logic Circuits:</b> Half Adder & Half Subtractor, Full Adder & Full Subtractor, Parallel Binary Adder, Binary Adder/Subtractor. <b>Combinational Logic Circuits:</b> Multiplexers & Demultiplexers, Implementation of Boolean equations using Multiplexer and Demultiplexer, Encoders & Decoders	8
<b>Unit-III</b> <b>Sequential Logic Circuits:</b> Latch, Flip Flops- R-S Flip-Flop, J-K Flip-Flop, Race Around Condition, Removing Race Around Condition, Master-Slave JK Flip-Flop, D Flip-Flop, T Flip-Flop, Applications of Flip-Flops.	8
<b>Unit-IV</b> <b>Introduction to Computer Organization:</b> Introduction to Computer and CPU (Computer Organization, Computer Design and Computer Architecture), Stored Program Concept- Von Neumann Architecture, Harvard Architecture, RISC and CISC Architecture. <b>Register Transfer and Micro operations:</b> Introduction to Registers, Instruction Format, Types of Instructions- Memory Reference Instructions, Register Reference Instructions and Input-Output Instructions. <b>Common Bus System:</b> Introduction to Common Bus System, Types of Buses (Data Bus, Control Bus, Address Bus), 16-bit Common Bus System--Data Movement among registers using Bus.	8

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

**Text Books:**

1. Computer System Architecture, M.M. Mano, Third Edition, PHI.
2. Digital Computer Electronics, Malvino, Second Edition, Mc-Graw Hill.
3. Modern Digital Electronics, R. P. Jain, Fourth Edition, TMH.

**Reference Books:**

1. Computer Organization and Architecture, Stallings, Eighth Edition, PHI.
2. Computer Organization and Architecture, J.P.Hayes, Third Edition, TMH.
3. Digital and Electronic Circuits, T. C. Bartee, McGraw Hill.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW204-19**

Course Name: **Mathematics**

Program: <b>B. Voc.</b>	L: <b>3</b> T: <b>0</b> P: <b>0</b>
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>3</b>
Semester: <b>2<sup>nd</sup></b>	Contact hours: <b>33</b>
Theory/Laboratory: <b>Theory</b>	Status (Elective/Core): <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	Represent data using various mathematical notions.
CO2	Explain different terms used in basic mathematics.
CO3	Describe various operations and formulas used to solve mathematical problems.

Detailed Contents	Contact hours
<b>Unit-I</b> Set Introduction, Objectives, Representation of Sets (Roster Method, Set Builder Method), Types of Sets (Null Set, Singleton Set, Finite Set, Infinite Set, Equal Set, Equivalent Set, Disjoint Set, Subset, Proper Subset, Power Set, Universal Set) and Operation with Sets (Union of Set, Intersection of Set, Difference of Set, Symmetric Difference of Set) Universal Sets, Complement of a Set.	9
<b>Unit-II</b> Logic Statement, Connectives, Basic Logic Operations (Conjunction, Disjunction, Negation) Logical Equivalence/Equivalent Statements, Tautologies and Contradictions.	8
<b>Unit-III</b> Matrices Introduction, Types of Matrix (Row Matrix, Column Matrix, Rectangular Matrix, Square Matrix, Diagonal Matrix, Scalar Matrix, Unit Matrix, Null Matrix, Comparable Matrix, Equal Matrix), Scalar Multiplication, Negative of Matrix, Addition of Matrix, Difference of two Matrix, Multiplication of Matrices, Transpose of a Matrix.	11
<b>Unit-IV</b> Progressions Introduction, Arithmetic Progression, Sum of Finite number of quantities in A.P, Arithmetic Means, Geometric Progression, Geometric Mean.	11

**Text Books:**

1. Discrete Mathematics and Its Applications by Kenneth H. Rosen, Mc Graw Hill, 6th Edition.
2. College Mathematics, Schaum's Series, TMH.

**Reference Books:**

1. Elementary Mathematics, Dr. RD Sharma.
2. Comprehensive Mathematics, Parmanand Gupta.
3. Elements of Mathematics, ML Bhargava.



**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW205-19**

Course Name: **Database Management Systems Laboratory**

Program: <b>B.Voc</b>	L: 0 T: 0 P: 3
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>1.5</b>
Semester: <b>2<sup>nd</sup></b>	
Theory/Laboratory : <b>Laboratory</b>	Percentage of numerical/design problems:-
Internal max. marks: <b>30</b>	Duration of end semester exam (ESE):-
External max. marks: <b>20</b>	Status (Elective/Core): <b>Core</b>
Total marks: <b>50</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	Able to understand various queries and their execution
CO2	Populate and query a database using SQL DML/DDDL commands.
CO3	Declare and enforce integrity constraints on a database
CO4	Programming PL/SQL including stored procedures, stored functions, cursors, packages
CO5	Able to design new database and modify existing ones for new applications and reason about the efficiency of the result

<b>Task 1:</b>	Used of CREATE, ALTER, RENAME, DROP, INSERT INTO, DELETE and UPDATE statement in the database tables (relations)
<b>Task 2:</b>	Use of simple select statement, select query on two relations, nesting of queries, aggregate functions, substring comparison & order by statement
<b>Task 3:</b>	Write a PL/SQL code to add two numbers and display the result. Read the numbers during run time.
<b>Task 4:</b>	Write a PL/SQL code to find sum of first 10 natural numbers using while and for loop.
<b>Task 5:</b>	Write a program to create a trigger which will convert the name of a student to upper case before inserting or updating the name column of student table.
<b>Task 6:</b>	Write a PL/SQL block to increase the salary of all doctors by 1000.
<b>Task 7:</b>	Write a PL/SQL code to multiply two numbers using procedure inside the block.
<b>Task 8:</b>	Design database for Student Management System for your college using E-R model and Normalization.
<b>Task 9:</b>	Design and Develop Conceptual Data Model (E-R Diagram) for Library Management System with all the necessary entities, attributes, constraints and relationships. Design and build Relational Data Model for application specifying all possible constraints.

**Recommended Hardware & Software:**

Intel Core i-3 / i-5 / i-7 processor with a speed of minimum 2 GHz, RAM 2 GB or higher, HDD 200 GB or higher, LED / LCD screen and Oracle/ Microsoft SQL Server/ MySQL/ Microsoft Access.

**Text Books:**

1. SQL, PL/SQL Programming Language of Oracle by 4<sup>th</sup> Revised Edition, Ivan Bayross.
2. Oracle PL/SQL Programming by 5<sup>th</sup> Edition, Steven Feuerstein and Bill Pribyl.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW206-19**

Course Name: **Internet Tools and Application Lab**

Program: <b>B. Voc.</b>	L: 0    T: 0    P: 3
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>1.5</b>
Semester: <b>2<sup>nd</sup></b>	Percentage of numerical/design problems:-
Theory/Laboratory: <b>Laboratory</b>	Duration of end semester exam (ESE):-
Internal max. marks: <b>30</b>	External max. marks: <b>20</b>
Total marks: <b>50</b>	Status (Elective/Core): <b>Core</b>

**Course Outcomes:** Students will be able to

<b>CO#</b>	<b>Course outcomes</b>
CO1	Understand basic concepts of Internet.
CO2	Design a web page.
CO3	Understand various applications of Internet .

**Instructions:**

1	Create a web page to show the structure of HTML
2	Show the use of formatting tags in HTML
3	Write HTML code to show the use of absolute and relative URL with Anchor Tag
4	Create a table in which colspan and rowspan elements are used.
5	Create a webpage to show the use of different lists available in HTML
6	Create a webpage to show the use of frame tag in HTML.
7	Create a webpage to show the use of different types of CSS
8	Create admission form for a college
9	Show the use of image tag and show images as buttons
10	Create a web page to show the use of image maps.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

**Text Books:**

1. Corner, Internetworking with TCP-IP: Principles, Protocols and Architecture, PHI.
2. Stephan Mack, Janan Platt, HTML 4.0 No Experience Required, BPB Publication.
3. Rick Darnell et al, HTML 4 Unleashed, Tech media Publications.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW-301-21**

Course Name: **Programming with Python**

Program: <b>B. Voc.</b>	L: 3 T: 0 P: 0
Branch: <b>Data &amp; Web Analytics</b>	Credits: 3
Semester: <b>3<sup>rd</sup></b>	Contact hours: <b>33</b>
Theory/Laboratory: <b>Theory</b>	Status (Elective/Core): <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	Explain environment, data types, operators used in Python.
CO2	Compare Python with other programming languages
CO3	Outline the use of control structures and numerous native data types with their methods.
CO4	Design user defined functions, modules, files, and packages and exception handling methods.
CO5	Write solutions for Object Oriented Programming Concepts.

Detailed contents	Contact hours
<p><b>Unit-I</b>            Introduction to Python Programming Language: Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages.            Python Data Types &amp; Input/Output:            Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command. [CO1, CO2]</p>	9
<p><b>Unit-II</b>            Control Structures:            Decision making statements, Python loops, Python control statements.            Python Native Data Types:            Numbers, Lists, Tuples, Sets, Dictionary, Functions &amp; Methods of Dictionary, Strings (in detail with their methods and operations). [CO3]</p>	8
<p><b>Unit-III</b>            Python Functions:            Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables.            Python Modules:            Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages. CO4, CO5]</p>	9
<p><b>Unit-IV</b>            Exception Handling:            Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python.            File Management in Python:            Operations on files (opening, modes, attributes, encoding, closing), read() &amp; write() methods, tell() &amp; seek() methods, renaming &amp; deleting files in Python, directories in Python. [CO4, CO5]</p>	7

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

**Text Books:**

1. Programming in Python, Pooja Sharma, BPB Publications, 2017.
2. Core Python Programming, R. Nageswara Rao, 2nd Edition, Dreamtech.

**Reference Books:**

1. Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.
  2. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.
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**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW302-21**

Course Name: **Introduction to Big Data**

Program: <b>B. Voc.</b>	L: <b>3</b> T: <b>0</b> P: <b>0</b>
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>3</b>
Semester: <b>3<sup>rd</sup></b>	Contact hours: <b>33</b>
Theory/Laboratory: <b>Theory</b>	Status (Elective/Core): <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	Discuss the need of handling Big Data
CO2	Set Environment for Big Data Handling
CO3	Explain the role of Hadoop and its components
CO4	Write basic Big Data Applications.

Detailed Contents	Contact hours
<b>Unit I</b>	
<p><b>Getting an Overview of Big Data:</b>            What is Big Data? History of Data Management – Evolution of Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics, Careers in Big Data, Future of Big Data. [CO1]</p> <p><b>Exploring the Use of Big Data in Business Context:</b>            Use of Big Data in Social Networking, Use of Big Data in Preventing Fraudulent Activities, Use of Big Data in Detecting Fraudulent Activities in Insurance Sector, Use of Big Data in Retail Industry. [CO2]</p> <p><b>Understanding Hadoop Ecosystem:</b>            Hadoop Ecosystem, Hadoop Distributed File System, MapReduce, Hadoop YARN, Introducing HBase, Combining HBase and HDFS, Hive, [CO3]</p>	9
<b>UNIT-II</b>	
Overview of HDFS. Architecture of HDFS, Advantages and disadvantages of HDFS, HDFS Daemons, HDFS Blocks, HDFS file write and read, NameNode as SPOF, Hadoop HA, heartbeats, block reports and re replication, Safemode of Namenode, Hadoop fs commands: cat, ls, put, get, rm, df, count, fsck, balancer, mkdir, du, copyfromlocal, copytolocal. [CO3]	8
<b>UNIT-III</b>	
Hadoop fs commands: expunge, chmod, chown, chgrp, setrep, stat. Hadoop dfsadmin commands. Introduction to Apache Pig, Need of Pig, Installation of Pig, Execution modes of Pig, Pig – Architecture, Grunt shell and basic utility commands, Data types and Operators in Pig, Analysing data stored in HDFS using Pig, Pig operators for Data analysis: Dump, Describe, Explanation, Illustration, Store. [CO4]	8
<b>UNIT- IV</b>	
Group, cogroup, join, split, filter, distinct, foreach, order by, limit operators. Functions in Pig: Eval functions, Load and store functions, Bag and tuple functions, String functions, Date time functions, Math functions, Case Studies: Analyzing various datasets with Pig. [CO4]	8

**Reference Books :**

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics, "Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley.
2. Big-Data Black Book, DT Editorial Services, Wiley India

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3. Massive Online Open Courses (MOOCS): Big Data University, Udacity and Coursera.
4. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
6. Eric Sammer, "Hadoop Operations", O'Reilley, 2012".

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW303-21**

Course Name: **Computer Fundamentals**

Program: <b>B. Voc.</b>	L: <b>3</b> T: <b>0</b> P: <b>0</b>
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>3</b>
Semester: <b>3<sup>rd</sup></b>	Contact hours: <b>33</b> hours
Theory/Practical: <b>Theory</b>	Elective status: core/elective: <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Prerequisite:** Information Technology

**Co requisite:** -NA-

**Additional material required in ESE:** -NA-

**Course Outcomes:** Students will be able to

CO#	Course Outcomes
CO 1	Explain importance of operating System in computer science.
CO 2	Describe different types of Operating System and its services.
CO 3	Build an understanding of the fundamental concepts of computer networking.
CO 4	Define basic data structure concepts.

Detailed Contents	Contact hours
<p><b>Unit – I : Operating System- I</b>  <b>Fundamentals of Operating system:</b> Functions of an operating system; Evolution and types of operating systems; Operating system as a resource manager; Structure of operating system (Role of kernel and Shell).</p> <p><b>Process &amp; Management:</b> Program vs. Process; State transition diagram; CPU Scheduling - Need of CPU scheduling, Different scheduling criteria's, scheduling algorithms (FCFS, SJF, Round-Robin). [CO1]</p>	<b>9</b>
<p><b>Unit – II : Operating System- II</b>  <b>Advanced Operating systems:</b> Introduction to Distributed Operating system, Multiprocessor Operating system and Real Time Operating System. Case study of Linux, Window. [CO2]</p>	<b>9</b>
<p><b>Unit – III : Computer Networks</b>  <b>Networks: Types-</b> LAN, MAN and WAN; <b>Topologies:</b> Bus, Star, Ring, Mesh, Tree, Hybrid  <b>Network Reference Models:</b> OSI Reference Model – Services, design issues &amp; applications; TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Models.  <b>Communication Channels:</b> Different types of transmission media. [CO3]</p>	<b>7</b>
<p><b>Unit – IV : Data Structures</b>  <b>Introduction to Data Structures:</b> Classification of Data, Analysis and Complexity of Algorithm. Introduction to different types of data structures. (array, linked list, stack, queue, tree and graph).</p>	<b>8</b>



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<b>Searching and Sorting:</b> Searching: Linear and binary search. Sorting: bubble sort, selection sort. [CO4]	
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**Recommended Books :**

1. Abraham Silberschatz and Peter Baer Galvin, Operating System Principles, Seventh Edition, Published by Wiley-India.
2. Tanenbaum, Andrew, Computer Networks, , Fifth Edition, PHI.
3. Horowitz & Sawhney: Fundamentals of Data Structures, Galgotia Publishers.
4. Aho Alfred V., Hopperoft John E., Ullman Jeffrey D., “Data Structures and Algorithms”, AddisonWesley
5. S.K. Basandra, Computer Today, Galgotia.

**Reference books :**

1. Naresh Chauhan, Principals of Operating System, Published by OXFORD University Press, India.
2. Behrouz A. Forouzan, Data Communication and Networking, Fourth Edition.
3. Stalling. Data and Computer Communications, , Ninth Edition, PHI.
4. Kruse R.L. Data Structures and Program Design in C; PHI
5. Yashwant Kanetkar, Understanding Pointers in C, BPB Publications.
6. Horowitz, S. Sahni, and S. Rajasekaran, Computer Algorithms, Galgotia Pub. Pvt. Ltd., 1998.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW304-21**

Course Name: **Advanced HTML & Java Script**

Program: <b>B. Voc.</b>	L: <b>3</b> T: <b>0</b> P: <b>0</b>
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>3</b>
Semester: <b>3<sup>rd</sup></b>	Contact hours: <b>33</b>
Theory/Laboratory: <b>Theory</b>	Status (Elective/Core): <b>Core</b>
Internal max. marks: <b>40</b>	External max. marks: <b>60</b>
Total marks: <b>100</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	Organize data on web pages.
CO2	Create multiple sections or frames on a wepages
CO3	Design forms with special controls using HTML
CO4	Outline the key web designing concepts using java script

Detailed Contents	Contact hours
<p><b>Unit-I:</b>  <b>Lists in HTML</b>            Type of Lists (Unordered List (Bullets), Ordered Lists (Numbering), Definition Lists.  <b>Tables in HTML</b>            Introduction (Header, Data rows, The Caption Tag), Using the Width and Border Attribute, Using the Cell padding Attribute, Using the Cell spacing Attribute, Using the BGCOLOR Attribute, Using the COLSPAN and ROWSPAN Attributes. [CO1]</p>	9
<p><b>Unit-II</b>  <b>Linking Documents in HTML</b>            Links (External Document References, Internal Document References), Image As Hyperlinks.  <b>Frames in HTML</b>            Introduction to Frames: The tag, The tag, Targeting Named Frames. DHTML: Cascading Style Sheets, Style Tag. [CO2]</p>	8
<p><b>Unit-III</b>  <b>Forms Used by a Web Site</b>            The Form Object, The Form Object's Methods (The Text Element, The Password Element, The Button Element, The Submit (Button) Element, The Reset (Button) Element, The Checkbox Element, The Radio Element, The Text Area Element, The Select and Option Element, The Multi Choice Select Lists Element). [CO3]</p>	8
<p><b>Unit IV</b>  <b>Introduction to JavaScript</b>            JS Introduction, Where To, Output, Statements, Syntax, Comments, Variables, Operators, Arithmetic, Assignment, Data Types, Functions, Objects, Events, Strings, String Methods, Numbers, Number Methods, Arrays, Array Methods, Array Sort, Array Iteration, Dates, Date Formats, Date Get Methods, Date Set Methods, Math, Random, Booleans, Comparisons, Conditions, Switch, Loop For, Loop While, Break, Type Conversion, Bitwise, RegExp, Errors, Scope, Hoisting, Strict Mode. [CO4]</p>	8

**Text Books:**

1. Internet for EveryOne: Alexis Leon, 1st Edition, Leon Techworld, Publication, 2009.
2. Greenlaw R; Heppe, "Fundamentals of Internet and WWW", 2nd Edition, Tata McGraw-Hill, 2007.
3. Raj Kamal, "Internet & Web Technologies", edition Tata McGraw-Hill Education.2009.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW305-21**

Course Name: **Programming with Python Laboratory**

Program: <b>B.Voc</b>	L: 0 T: 0 P: 3
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>1.5</b>
Semester: <b>3<sup>rd</sup></b>	
Theory/Laboratory : <b>Laboratory</b>	Percentage of numerical/design problems:-
Internal max. marks: <b>30</b>	Duration of end semester exam (ESE):-
External max. marks: <b>20</b>	Status (Elective/Core): <b>Core</b>
Total marks: <b>50</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	Outline various programming constructs like data types and control structures of Python.
CO2	Implement different data structures
CO3	Implement modules and functions.
CO4	Illustrate concept of object oriented programming.
CO5	Implement file handling.

<b>Task 1:</b>	Compute sum, subtraction, multiplication, division and exponent of given variables input by the user
<b>Task 2:</b>	Compute area of following shapes: circle, rectangle, triangle, square, trapezoid and parallelogram
<b>Task 3:</b>	Compute volume of following 3D shapes: cube, cylinder, cone and sphere
<b>Task 4:</b>	Compute and print roots of quadratic equation $ax^2+bx+c=0$ , where the values of a, b, and c are input by the user.
<b>Task 5:</b>	Print numbers up to N which are not divisible by 3, 6, 9,, e.g., 1, 2, 4, 5, 7,....
<b>Task 6:</b>	Write a program to determine whether a triangle is isosceles or not?
<b>Task 7:</b>	Print multiplication table of a number input by the user.
<b>Task 8:</b>	Compute sum of natural numbers from one to n number.
<b>Task 9:</b>	Print Fibonacci series up to n numbers e.g. 0 1 1 2 3 5 8 13.....n
<b>Task 11:</b>	Compute factorial of a given number
<b>Task 12:</b>	Design a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.
<b>Task 13:</b>	Design a Python class to reverse a string 'word by word'
<b>Task 14:</b>	Construct a Python program to write and append text to a file and display the text
<b>Task 15:</b>	Design a Python program to read first n lines of a text file.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

**Text Books:**

1. Programming in Python, Pooja Sharma, BPB Publications, 2017.
2. Core Python Programming, R. Nageswara Rao, 2nd Edition, Dreamtech.

**Reference Books:**

1. Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.
2. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW306-21**

Course Name: **Advanced HTML & Java Script Laboratory**

Program: <b>B.Voc</b>	L: 0 T: 0 P: 3
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>1.5</b>
Semester: <b>3<sup>rd</sup></b>	
Theory/Laboratory : <b>Laboratory</b>	Percentage of numerical/design problems:-
Internal max. marks: <b>30</b>	Duration of end semester exam (ESE):-
External max. marks: <b>20</b>	Status (Elective/Core): <b>Core</b>
Total marks: <b>50</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	Design pages with simple tags in HTML
CO2	Create web pages with Audio and Video content in it
CO3	Illustrate the movement from one web page to another
CO4	Implement advanced web designing concepts using java script.
CO5	Execute a small web based project for the benefit of society

<b>Task 1:</b>	Create a simple HTML page to demonstrate the use of different tags
<b>Task 2:</b>	Design index page of a book on web designing.
<b>Task 3:</b>	Display Letter Head of your college on a web page.
<b>Task 4:</b>	Create a Hyperlink to move around within a single page rather than to load another page.
<b>Task 5:</b>	Display letter using different Text formatting Tags
<b>Task 6:</b>	Design Time Table of your department and highlights of most important periods
<b>Task 7:</b>	Use Tables to provide layout to your web page.
<b>Task 8:</b>	Embed Audio and Video into your web page.
<b>Task 9:</b>	Divide a web page vertically and horizontally and display logo of your college in left pane and logo of university in right pane.
<b>Task 11:</b>	Design front page of hospital with different style sheets.
<b>Task 12:</b>	Write a program to create a login form. On submitting the form, the user should get navigated to a profile page using JavaScript.
<b>Task 13:</b>	Write a code to create a Registration Form. On submitting the form, the user should be asked to login with the new credentials using JavaScript.
<b>Task 14:</b>	Write an HTML code to create your Institute website/Department website/ Tutorial website for specific subject. Also use Java Script for validation

**Reference Books:**

1. Greenlaw R; Hepp E, "Fundamentals of Internet and www", 2nd Edition, Tata. McGraw-Hill, 2007.
2. A Beginner's Guide to HTML [http://www.Ncsa.Nine.Edit/General/Internet/www/ a. html.prmter](http://www.Ncsa.Nine.Edit/General/Internet/www/a.html.prmter).

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

Course Code: **BVDW307-21**

Course Name: **Introduction to Big Data Laboratory**

Program: <b>B.Voc</b>	L: 0 T: 0 P: 3
Branch: <b>Data &amp; Web Analytics</b>	Credits: <b>1.5</b>
Semester: <b>4<sup>th</sup></b>	
Theory/Laboratory : <b>Laboratory</b>	Percentage of numerical/design problems:-
Internal max. marks: <b>30</b>	Duration of end semester exam (ESE):-
External max. marks: <b>20</b>	Status (Elective/Core): <b>Core</b>
Total marks: <b>50</b>	

**Course Outcomes:**

CO#	Course outcomes
CO1	Setting up environment for handling Big Data.
CO2	Work with files and directories.
CO3	Implement basic applications for Big Data.

<b>Task 1:</b>	Installation of Hadoop.
<b>Task 2:</b>	File management tasks in Hadoop. <ul style="list-style-type: none"> <li>• create directory</li> <li>• list contents of directory</li> <li>• upload and download a file in HDFS</li> <li>• see contents of a file</li> <li>• copy a file from source to destination</li> <li>• move file from source to destination, etc.</li> </ul>
<b>Task 3:</b>	Installation of pig
<b>Task 4:</b>	Exercises to work on different data types and operators in pig.
<b>Task 5:</b>	Exercises to implement different functions in pig.
<b>Task 6:</b>	Analyzing datasets with Pig.

**Reference Books :**

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics, "Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley.
2. Big-Data Black Book, DT Editorial Services, Wiley India
3. Massive Online Open Courses (MOOCS): Big Data University, Udacity and Coursera.
4. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
6. Eric Sammer, "Hadoop Operations", O'Reilley, 2012".

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

**Course Code: BVDW401-21**

**Course Name: Data Warehouse and Mining**

<b>Program:</b> B.Voc Web & Data Analytics	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Branch:</b> Computer Applications	<b>Credits:</b> 4
<b>Semester:</b> 4 <sup>th</sup>	<b>Contact hours:</b> 44 hours
<b>Theory/Practical:</b> Theory	<b>Percentage of numerical/design problems:</b> 20%
<b>Internal max. marks:</b> 40	<b>Duration of end semester exam (ESE):</b> 3hrs
<b>External max. marks:</b> 60	<b>Elective status:</b> Elective
<b>Total marks:</b> 100	

**Prerequisite:** -NA-

**Co requisite:** -NA-

**Additional material required in ESE:** -NA-

**Course Outcomes:** After completing this course, students will be able to:

<b>CO#</b>	<b>Course outcomes</b>
CO1	Highlight the need of Data Warehousing & Mining
CO2	Differentiate between the Transactional and Analytical data models.
CO3	Identify the real life applications where data mining can be applied.
CO4	Apply different data mining algorithms on wide range of data sets.
CO5	Explain the role of visualization in data representation and analysis.

<b>Detailed Contents</b>	<b>Contact hours</b>
<b>Unit-I</b> Need for strategic information, difference between operational and Informational data stores (OLAP vs OLTP). Data warehouse definition, characteristics, Data warehouse role and structure, Data warehouse architecture, Approaches to build a data warehouse, Building a data warehouse, Metadata & its types, OLAP Operations, OLAP servers, [CO1]	11
<b>Unit-II</b> Data Pre-processing: Need, Data Summarization, Methods. Denormalization, Multidimensional data model, Schemas for multi-dimensional data (Star schema, Snowflake Schema, Fact Constellation Schema, Difference between different schemas. [CO2]	11
<b>Unit-III</b> Data Mining: Definition, Data Mining process, Data mining methodology, Data mining tasks, Mining various Data types & issues. Attribute-Oriented Induction, Association rule mining, Frequent itemset mining, The Apriori Algorithm, [CO3]	12
<b>Unit-IV</b> Overview of classification, Classification process, Decision tree, Decision Tree Induction, Attribute Selection Measures. [CO4] Introduction to Clustering, Types of clusters, Clustering methods, Data visualization & its tools, Implementation of classification and clustering algorithms using WEKA (open Source tool). [CO5]	10

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**B. Voc. (Data & Web Analytics), Batch-2021**

**Text Books:**

1. Data Warehousing, Data Mining & Olap by Berson, Tata Mcgraw- Hill.
2. Han J., Kamber M. and Pei J., Data mining concepts and techniques, Morgan Kaufmann Publishers (2011) 3rd ed.
3. Pudi V., Krishana P.R., Data Mining, Oxford University press, (2009) 1st ed.
4. Adriaans P., Zantinge D., Data mining, Pearson education press (1996), 1st ed.
5. Pooniah P., Data Warehousing Fundamentals, Willey interscience Publication, (2001), 1st ed.

**Course Code: BVDW402-21**

**Course Name: Data Analytics using R**

<b>Program:</b> B.Voc Web & Data Analytics	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Branch:</b> Computer Applications	<b>Credits:</b> 4
<b>Semester:</b> 4 <sup>th</sup>	<b>Contact hours:</b> 44 hours
<b>Theory/Practical:</b> Theory	<b>Percentage of numerical/design problems:</b> 20%
<b>Internal max. marks:</b> 40	<b>Duration of end semester exam (ESE):</b> 3hrs
<b>External max. marks:</b> 60	<b>Elective status:</b> Elective
<b>Total marks:</b> 100	

**Prerequisite:** Logics of basic programming terminologies.

**Co requisite:** Simulation study.

**Additional material required in ESE:** -NA-

**Course Outcomes:**

CO#	Course Outcomes
CO1	Identify the key components of R programming Language.
CO2	Define the concept of data Science.
CO3	Differentiate between vectors and arrays.
CO4	Outline the usage of data frames, lists, factors, tables and R structures.
CO5	Explain the need and utilization of various visualization tools.

Detailed Contents	Contact hours
<p><b>Unit-I</b></p> <p><b>R Programming Fundamentals:</b> Introduction to R, Installing R, Windows/Linux/Mac Installation, Setting up Path, Using Packages, and Running R: Interactive Mode, Batch Mode, Getting Help, Startup and Shut Down.[CO1]</p> <p><b>Vectors:</b> Scalars, Vectors, Arrays and Matrices, Declarations, Recycling, Common Vector Operations, Using all() and any(), Na and Null Values, Filtering, ifelse() Function.[CO3]</p> <p><b>Matrices and Arrays:</b> Creating Matrices, General Matrix Operations, Applying Functions to Matrix Rows and Columns, Adding &amp; Deleting Matrix Rows and Columns, Difference Between Matrix and Vector.[CO3]</p>	11
<p><b>Unit-II</b></p> <p><b>Lists:</b> Creating Lists, General List Operations, Accessing List Components and Values, Applying Functions to Lists, Recursive Lists. <b>Data Frames:</b></p>	11



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<p>Creating Data Frames, Merging Data Frames, Applying Functions to Data Frames. [CO4]  <b>Factors and Tables:</b> Introduction, Common Functions use with Factors, Working with Tables.[CO4]  <b>R Programming Structures:</b> Control Statements, Arithmetic and Boolean Operators, Default Values for Arguments, Return Values, Recursion.[CO4]</p>	
<p><b>Unit-III</b>  <b>Object Oriented Programming:</b> Concept of Classes, S3 Classes, S4 Classes, S3 Versus S4 Classes, Managing Objects.[CO1]  <b>Input/Output:</b> Accessing Keyboard and Monitor, Reading and Writing Files, Accessing the Internet.  <b>String Manipulation:</b> Overview of String Manipulation Functions [grep(), nchar(), paste(), sprintf(), substr(), strsplit(), regexpr(), gregexpr(), Regular expression].[CO5]</p>	12
<p><b>Unit-IV</b>  <b>Graphics:</b> Creating Graphs, Customizing Graphs, Saving Graphs to Files, Creating 3D Plots.  <b>Debugging:</b> Principles of Debugging, Use of Debugging Tool, Using R Programming Debugging Facilities. [CO3]  <b>Simulation:</b> Generating Random Numbers, Setting the Random Number Seed, Simulating a Linear Model, Random Sampling.[CO5]</p>	10

**Text Books:**

1. The ART of R Programming, Norman Matloff, No Starch Press.
2. R Programming for Data Science, Roger D. Peng, Lean Publishing.
3. R Programming for Beginners, S. Rakshit, TMH.

**Reference Books:**

1. Data Analytics using R, Seema Acharya, TMH.

**Course Code:** BVDW 403-21

**Course Name:** Data Structures

<b>Program:</b> B.Voc Web & Data Analytics	<b>L: 3 T: 1 P: 0</b>
<b>Branch:</b> Computer Applications	<b>Credits: 4</b>
<b>Semester:</b> 4 <sup>th</sup>	<b>Contact hours:</b> 44 hours
<b>Theory/Practical:</b> Theory	<b>Percentage of numerical/design problems: --</b>
<b>Internal max. marks:</b> 40	<b>Duration of end semester exam (ESE):</b> 3hrs
<b>External max. marks:</b> 60	<b>Elective status:</b> Core
<b>Total marks:</b> 100	

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**B. Voc. (Data & Web Analytics), Batch-2021**

**Prerequisite:** -NA-

**Co requisite:** -NA-

**Additional material required in ESE:** -NA-

**Course Outcomes:** Students will be able to

CO#	Course outcomes
CO1	Apply appropriate constructs of Programming language, coding standards for application development
CO2	Select appropriate data structures for problem solving and programming
CO3	Illustrate the outcome of various operations on data structures.
CO4	Identify appropriate searching and/or sorting techniques for wide range of problems and data types.
CO5	Differentiate between various types of data structures

Detailed Contents	Contact hours
<p><b>Unit-I</b></p> <p><b>Introduction to Data Structures:</b>            Algorithms and Flowcharts, Complexity of Algorithm, Introduction and Definition of Data Structure, pointer, declaration and use of pointer, pointer arithmetic and dynamic allocation using pointer, structures/classes with pointers, Various types of Data Structure, operations on data structure.</p> <p><b>Arrays:</b>            Introduction to Arrays, insertion and deletion in One Dimensional Array and Two Dimensional Array. [CO1]</p>	10
<p><b>Unit-II</b></p> <p><b>Linked Lists</b>            Introduction, Representation of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, And Circular Doubly Linked List, Operations of Linked Lists.[CO2,5]</p>	8
<p><b>Unit-III</b></p> <p><b>Stacks and Queue</b>            Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Introduction to Queue, Definition, Queue Implementation, Operations of Queue. [CO 2,3,5]</p>	14
<p><b>Unit-IV</b></p> <p><b>Searching and Sorting:</b> Searching, Types of Searching like linear and binary search, Sorting, Types of sorting like quick sort, bubble sort, merge sort, selection sort. [CO4]</p>	12

**Text Books**

1. Brijesh Bakariya. Data Structures and Algorithms Implementation through C, BPB Publications.
2. Kruse R.L. Data Structures and Program Design in C; PHI

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3. Aho Alfred V., Hopperoft John E., Ullman Jeffrey D., “Data Structures and Algorithms”, AddisonWesley

**Reference books**

1. Horowitz & Sawhaney: Fundamentals of Data Structures, Galgotia Publishers.
2. Yashwant Kanetkar, Understanding Pointers in C, BPB Publications.
3. Horowitz, S. Sahni, and S. Rajasekaran, Computer Algorithms, Galgotia Pub. Pvt. Ltd., 1998.

**Course Code: BVDW 404-21**

**Course Name: Digital Marketing**

<b>Program:</b> B.Voc Web & Data Analytics	<b>L: 3 T: 1 P: 0</b>
<b>Branch:</b> Computer Applications	<b>Credits: 4</b>
<b>Semester:</b> 4 <sup>th</sup>	<b>Contact hours: 44 hours</b>
<b>Theory/Practical:</b> Theory	<b>Percentage of numerical/design problems: --</b>
<b>Internal max. marks:</b> 40	<b>Duration of end semester exam (ESE): 3hrs</b>
<b>External max. marks:</b> 60	<b>Elective status:</b> Elective
<b>Total marks:</b> 100	

**Prerequisite: -NA-**

**Co requisite: -NA-**

**Additional material required in ESE: -NA-**

**Course Outcomes:**

CO#	Course outcomes
CO1	Highlight the key elements of a digital marketing strategy.
CO2	Choose the right platform for digital marketing
CO3	Identify the major digital marketing channels.
CO4	Design content for digital marketing.
CO5	Develop digital marketing strategy and plan.

Detailed Contents	Contact hours
<p><b>Unit-I</b></p> <p><b>Introduction to Digital Marketing</b>            Difference between Traditional Marketing and Digital Marketing, Benefits of using Digital Media, Inbound and Outbound Marketing, Online marketing POEM: (Paid, Owned, and Earned Media), Components of Online Marketing (Email, Forum, Social network, Banner, Blog), Impact of Online Marketing, Basics of Affiliate Marketing, Viral Marketing, Influencer Marketing, Referral Marketing. [CO1]</p> <p><b>Email Marketing:</b> Email newsletters, Digests, Dedicated Emails, Lead Nurturing, Sponsorship Emails and Transactional Emails, Drawbacks of Email Marketing [CO1]</p> <p><b>Social Media Marketing (SMM):</b> Different types of Social Media Marketing like Facebook, LinkedIn, Twitter, Video, Instagram etc.[CO1]</p>	11
<p><b>Unit –II</b></p> <p><b>Search Engine Optimisation (SEO)</b></p>	11

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<p>About SEO, Need of an SEO friendly website, Importance of Internet and Search Engines; Role of Keywords in SEO. [CO2]</p> <p><b>On-Page Optimization (Onsite):</b> Basics of Website Designing / Development; HTML Basics for SEO; Onsite Optimization Basics; Website Structure and Navigation Menu Optimization; SEO Content Writing. Keywords Research and Analysis (eg. SWOT analysis of website, finding appropriate keywords). <b>Off Page Optimization:</b> Introduction; Local marketing of websites depending on locations; Promoting Subsequent pages of the website. Introduction to organic SEO vs non-organic SEO; Social Media Optimization Techniques and Page Rank Technology.[CO2]</p>	
<p><b>Unit-III</b></p> <p><b>Website Planning &amp; Creation</b></p> <p><b>Content Marketing Strategy:</b> Goals and concepts, Strategic building blocks, Content creation &amp; channel distribution, Tools of the trade, Advantages and challenges.</p> <p><b>Keywords Research and Analysis:</b> Introduction to Keyword Research; Business Analysis; Types of Keywords; Keywords Analysis Tools.[CO3]</p> <p><b>Web Presence:</b> Online presence and driving more traffic for a website, Search result visibility in search engines for chosen keyword and phrases, Using e-mail marketing to drive traffic for a website, Posting social media content for lead generation, Tools to create and manage content, Use of Blogging as content strategy. [CO3]</p> <p><b>Creating content:</b> Writing and posting content on the web and in social networks, blog and video; Create, manage and implement a content marketing strategy; Monitoring and recording results to improve content marketing campaigns; Successful content marketing strategies and case studies.[CO4]</p>	<p><b>12</b></p>
<p><b>Unit-IV</b></p> <p><b>Online Advertising, Mobile Marketing and Web analytics</b></p> <p>Introduction to Online Advertising and its advantages, Paid versus Organic, Pay Per Click (PPC) Model. Basic concepts Cost per Click (CPC), CPM, CTR, CR etc. About Mobile Marketing, Objectives of Mobile Advertising, Creating a Mobile Marketing Strategy, Introduction to SMS Marketing. About Web Analytics, Types of Web Analytics (On-site, Off-site), Importance of Web Analytics [CO5]</p>	<p><b>10</b></p>

**Text Books:**

1. Puneet Singh Bhatia, Fundamentals of Digital Marketing First Edition, Publication Pearson.
2. Vandana Ahuja, Digital Marketing 1st Edition, Publication Oxford
3. Shivani Karwal, “Digital Marketing Handbook: A Guide to search Engine Optimization, Pay Per Click Marketing, Email Marketing and Content Marketing”, CreateSpace Independent Publishing Platform, 1st edition.

**Reference Books:**

1. Ian Dodson, The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted and Measurable Online Campaigns, Publication Wiley India Pvt Ltd.

**IK Gujral Punjab Technical University Jalandhar**  
**B. Voc. (Data & Web Analytics), Batch-2021**

- Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0: Moving from Traditional to Digital, Publication Wiley India Pvt Ltd.
- Venakataramana Rolla, "Digital Marketing Practice guide for SMB: SEO, SEM and SMM", CreateSpace Independent Publishing Platform, First edition.
- Enge, E., Spencer, S., Stricchiola, J., & Fishkin, R. (2012). The art of SEO. " O'Reilly Media, Inc."

**E Books/ Online learning material:**

- www.sakshat.ac.in
- https://swayam.gov.in
- https://www.edx.org/course/online-marketing-strategies-curtinx- mkt5x
- https://www.emarketinginstitute. org/free-courses/ eMarketing Institute

**Course Code: BVDW 405-21**

**Course Name: Data Analytics using R Laboratory**

<b>Program:</b> B.Voc Web & Data Analytics	<b>L: 0 T: 0 P:4</b>
<b>Branch:</b> Computer Applications	<b>Credits: 2</b>
<b>Semester:</b> 4 <sup>th</sup>	<b>Contact hours:</b> 4 hours per week
<b>Theory/Practical:</b> Practical	<b>Percentage of numerical/design problems:</b> --
<b>Internal max. marks:</b> 60	<b>Duration of End Semester Exam (ESE):</b> 3hrs
<b>External max. marks:</b> 40	<b>Elective Status:</b> Elective
<b>Total marks:</b> 100	

**Prerequisite:** - Logics of basic programming terminologies.

**Co requisite:** - Simulation study.

**Additional material required in ESE:** - Record the *Simulation Results* on practical file.

**Course Outcomes:** Students will be able to

CO#	Course Outcomes
CO1	Write programs for arrays and matrices.
CO2	Execute data frames and lists.
CO3	Differentiate between arrays from vectors.
CO4	Implement factors in R
CO5	Execute minor projects using R.

**Instructions:** All programs are to be developed in R Programming Language.

1.	Design a program to take input from the user (name and age) and display the values through R Programming.
2.	Write a program to get the details of the objects in memory using R Programming.
3.	Create 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 using R Programming.
4.	Create a vector which contains 10 random integer values between -50 and +50 using R Programming.
5.	Demonstrate through a program to display the details of the objects in memory.
6.	Write a R program to get the first 10 Fibonacci numbers.
7.	Show all prime numbers up to a given number using R programming..
8.	Design a R program to find the factors of a given number.
9.	Write a R program to find the maximum and the minimum value of a given vector.

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10.	Write a program to get the unique elements of a given string and unique numbers of vector.
11.	Convert a given matrix to a 1 dimensional array through R programming.
12.	Write a R program to create an array of two 3x3 matrices each with 3 rows and 3 columns from the given two vectors.
13.	Create a 3 dimensional array of 24 elements using dim() function.
14.	Write a R program to create an array using four given columns, three given rows and two given tables, also display the contents of the array.
15.	To convert a given matrix to 1 dimensional array design a R program.
16.	Write a R program to concatenate two given factor in a single factor.
17.	Write a R program to create an 3 dimensional array of 24 elements using the dim() function.
18.	Construct a R program to create an array of two 3x3 matrices each with 3 rows and 3 columns from the given two vectors. Print the second row of the second matrix of the array and the element in the 3rd row and 3rd column of the 1st matrix.
19.	Write a R program to create a data frame from four given vectors.
20.	Write a program to get the structure of a given data frame.
21.	Design a R program to get the statistical summary and nature of the data of a given data frame.
22.	Write a R program to extract specific column from a data frame using column name.
23.	Design a R program to create a data frame from four given vectors.
24.	Demonstrate a R program to get the structure of a given data frame.
25.	Write a R program to get the statistical summary and nature of the data of a given data frame.
26.	Design a R program to extract specific column from a data frame using column name.
27.	Demonstrate a R program to create a data frame from four given vectors.
28.	Write a R program to create a matrix taking a given vector of numbers as input. Display the matrix.
29.	Construct a R program to create a matrix taking a given vector of numbers as input and define the column and row names. Display the matrix.
30.	Write a R program to access the element at 3 <sup>rd</sup> column and 2 <sup>nd</sup> row, only the 3 <sup>rd</sup> row and only the 4 <sup>th</sup> column of a given matrix.
31.	Develop a R program to create a vector of a specified type and length. Create vector of numeric, complex, logical and character types of length 6.
32.	Write a R program to add two vectors of integers type and length.
33.	Design a R program to append value to a given empty vector
34.	Write a R program to multiply two vectors of integers type and length.
35.	Design a R program to create a list containing strings, numbers, vectors and a logical values.
36.	Write a R program to list containing a vector, a matrix and a list and give names to the elements in the list.
37.	Demonstrate a R program to find the levels of factor of a given vector.
38.	Write a R program to change the first level of a factor with another level of a given factor.
39.	Design a R program to create an ordered factor from data consisting of the names of months.
40.	Construct graphical output & display the results of any five tasks using simulator.

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**B. Voc. (Data & Web Analytics), Batch-2021**

**Text Books:**

1. The ART of R Programming, Norman Matloff, No Starch Press.
2. R Programming for Data Science, Roger D. Peng, Lean Publishing.
3. R Programming for Beginners, S. Rakshit, TMH.

**Reference Books:**

1. Data Analytics using R, Seema Acharya, TMH.

**Course Code: BVDW 406-21**

**Course Name: Data Structures Laboratory**

<b>Program:</b> B.Voc Web & Data Analytics	<b>L: 0 T: 0 P: 4</b>
<b>Branch:</b> Computer Applications	<b>Credits: 2</b>
<b>Semester:</b> 4 <sup>th</sup>	<b>Contact hours:</b> 4 hours per week
<b>Theory/Practical:</b> Practical	<b>Percentage of numerical/design problems: --</b>
<b>Internal max. marks:</b> 60	<b>Duration of end semester exam (ESE):</b> 3hrs
<b>External max. marks:</b> 40	<b>Elective status:</b> Core
<b>Total marks:</b> 100	

**Prerequisite: -NA-**

**Co requisite: -NA-**

**Additional material required in ESE: - NA-**

**Course Outcomes:** Student will be able to

<b>CO#</b>	<b>Course outcomes</b>
CO1	Implement Dynamic memory allocation.
CO2	Create different data structures in C/ C++
CO3	Implement various operations of all data structures
CO4	Illustrate the outcome of various operations with the help of examples.
CO5	Write programs to implement various types of searching and sorting algorithms

**Instructions:** Programs may be developed in C/C++/Python/Java language.

**List of assignments:**

1	Write a program to implement pointers.
2	Write a program to implement dynamic memory allocation using pointers.
3	Write a program to create self referential structure using pointers.
4	Program to insert, delete and traverse an element from an array
5	Program to merge one dimensional arrays
6	Program for implementing selection sort.
7	Program for implementing insertion sort.
8	Program for implementing bubble sort.
9	Program for implementing merge sort.
10	Program for implementing Queue using array.
11	Program to create linked list
12	Program to insert and delete in linked list
13	Program to search in linked list.
14	Write a program to implement linear search.
15	Write a program to implement binary search.
16	Write a program to find the sum of two 2-D arrays.
17	Write a program to multiply 2 2-D arrays.

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18	Write a program to print the diagonal elements of the 2-D array.
19	Write a program to implement push operation in stack.
20	Write a program to implement pop operation using stack.

**Reference Books:**

1. Brijesh Bakariya. Data Structures and Algorithms Implementation through C, BPB Publications.
2. Aho Alfred V., Hopperoft John E., Ullman Jeffrey D., "Data Structures and Algorithms", AddisonWesley
3. Horowitz & Sawhaney: Fundamentals of Data Structures, Galgotia Publishers.