

Scheme & Syllabus of **Bachelor of Science in Data Analytics** **(B. Sc. Data Analytics)**

Batch 2021 onwards



By

Board of Study Computer Applications

Department of Academics

IK Gujral Punjab Technical University

**I. K. Gujral Punjab Technical University Bachelor of
Science in Data Analytic (B Sc. Data Analytics)**

Bachelors of Science in Data Analytic (B.Sc. Data Analytic):

It is a Under Graduate (UG) Programme of 3 years duration (6 semesters)

PROGRAM OUTCOMES (POs)

Program: B Sc in Data Analytics

1. **Basic knowledge:** An ability to apply knowledge of basic mathematics, science and domain knowledge to solve the computational problems.
2. **Discipline knowledge:** An ability to apply discipline –specific knowledge to solve core and/or applied computational problems.
3. **Experiments and practice:** An ability to plan and perform experiments and practices and to use the results to solve computational problems.
4. **Tools Usage:** Apply appropriate technologies and tools with an understanding of limitations.
5. **Profession and society:** Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional practice.
6. **Environment and sustainability:** Understand the impact of the computational solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
7. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the professional practice.
8. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.
9. **Communication:** An ability to communicate effectively.
10. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes.

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First Semester

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
UGCA1901	Core Theory	Mathematics	3	1	0	40	60	100	4
UGCA1902	Core Theory	Fundamentals of Computer and IT	3	1	0	40	60	100	4
UGCA1903	Core Theory	Problem Solving using C	3	1	0	40	60	100	4
UGCA1904	Practical/Laboratory	Workshop on Desktop Publishing	0	0	4	60	40	100	2
UGCA1905	Core Practical/Laboratory	Problem Solving using C Laboratory	0	0	4	60	40	100	2
UGCA1906	Core Practical/Laboratory	Fundamentals of Computer and IT Laboratory	0	0	4	60	40	100	2
BTHU103/18	Ability Enhancement Compulsory Course (AECC)-I	English	1	0	0	40	60	100	1
BTHU104/18	Ability Enhancement Compulsory Course (AECC)	English Practical/Laboratory	0	0	2	30	20	50	1
HVPE101-18	Ability Enhancement Compulsory Course (AECC)	Human Values, De-addiction and Traffic Rules	3	0	0	40	60	100	3
HVPE102-18	Ability Enhancement Compulsory Course (AECC)	Human Values, De-addiction and Traffic Rules (Lab/ Seminar)	0	0	1	25	--**	25	1
BMPD102-18		Mentoring and Professional Development	0	0	1	25	--**	25	1
	TOTAL		13	3	16	460	440	900	25

****The Human Values, De-addiction and Traffic Rules (Lab/ Seminar) and Mentoring and Professional Development course will have internal evaluation only. (See guidelines at the last page of this file)**

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Second Semester

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
UGCA1985	Core Theory	Probability and Statistics	3	1	0	40	60	100	4
UGCA1922	Core Theory	Database Management Systems	3	1	0	40	60	100	4
UGCA1909	Core Theory	Object Oriented Programming using C++	3	1	0	40	60	100	4
UGCA1910	Core Practical/Laboratory	Object Oriented Programming using C++ Laboratory	0	0	4	60	40	100	2
UGCA1986	Core Practical/Laboratory	Probability and Statistics Laboratory	0	0	4	60	40	100	2
UGCA1925	Core Practical/Laboratory	Database Management Systems Laboratory	0	0	4	60	40	100	2
EVS102-18	Ability Enhancement Compulsory Course (AECC) -III	Environmental Studies	2	0	0	40	60	100	2
BMPD202-18		Mentoring and Professional Development	0	0	1	25	--	25	1
	TOTAL		11	3	13	365	360	725	21

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Third Semester

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
UGCA1923	Core Theory	Operating Systems	3	1	0	40	60	100	4
UGCA1931	Core Theory	Data Warehouse and Mining	3	1	0	40	60	100	4
UGCA1915	Core Theory	Data Structures	3	1	0	40	60	100	4
UGCA1926	Core Practical/Laboratory	Operating Systems Laboratory	0	0	4	60	40	100	2
UGCA1937	Core Practical/Laboratory	Data Warehouse and Mining Laboratory	0	0	4	60	40	100	2
UGCA1918	Core Practical/Laboratory	Data Structures Laboratory	0	0	4	60	40	100	2
UGCA1914	Skill Enhancement Course-I	Programming in Python	3	0	0	40	60	100	3
UGCA1917	Skill Enhancement Course- Laboratory	Programming in Python Laboratory	0	0	2	30	20	50	1
BMPD302-18		Mentoring and Professional Development	0	0	1	25	--	25	1
	TOTAL		12	3	15	395	380	775	23

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Course Code: UGCA1901

Course Name: Mathematics

Program: B. Sc. Data Analytics	L: 3 T: 1 P: 0
Branch: Computer Applications	Credits: 4
Semester: 1 st	Contact hours: 44 hours
Internal max. marks: 40	Theory/Practical: Theory
External max. marks: 60	Duration of end semester exam (ESE): 3hrs
Total marks: 100	Elective status: core/elective: Core

Prerequisite: Student must have the knowledge of Basic Mathematics.

Co requisite: NA.

Additional material required in ESE: Minimum two exercises of each concept will be recorded in the file and the file will be submitted in End Semester Examinations.

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

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
<p><u>Unit-I</u> 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.</p>	12 hours
<p><u>Unit-II</u> Logic Statement, Connectives, Basic Logic Operations (Conjunction, Disjunction, Negation) Logical Equivalence/Equivalent Statements, Tautologies and Contradictions.</p>	10 hours
<p><u>Unit -III</u> 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,</p>	12 hours

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Negative of Matrix, Addition of Matrix, Difference of two Matrix, Multiplication of Matrices, Transpose of a Matrix.	
<u>Unit-IV</u> Progressions Introduction, Arithmetic Progression, Sum of Finite number of quantities in A.P, Arithmetic Means, Geometric Progression, Geometric Mean.	10 hours

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

E Books/ Online learning material

1. www.see.leeds.ac.uk/geo-maths/basic_maths.pdf
2. www.britannica.com/science/matrix-mathematics
3. www.pdfdrive.com/schaums-outline-of-discrete-mathematics-third-edition-schaums-e6841453.html

Course Code: UGCA1902

Course Name: Fundamentals of Computer and IT

Program: B. Sc. Data Analytics	L: 3 T: 1 P: 0
Branch: Computer Applications	Credits: 4
Semester: 1 st	Contact hours: 44 hours
Internal max. marks: 40	Theory/Practical: Theory
External max. marks: 60	Duration of end semester exam (ESE): 3hrs
Total marks: 100	Elective status: Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
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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	Understand an operating system and its working, and solve common problems related to operating systems
CO4	Learn basic word processing, Spreadsheet and Presentation Graphics Software skills.
CO5	Study to use the Internet safely, legally, and responsibly

Detailed Contents	Contact hours
<p>Unit-I</p> <p>Human Computer Interface Concepts of Hardware and Software; Data and Information.</p> <p>Functional Units of Computer System: CPU, registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.</p> <p>Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter.</p> <p>Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks.</p> <p>Data Representation: Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions and Binary Arithmetic (Addition/ Subtraction/ Multiplication) Applications of IT.</p>	12
<p>Unit-II</p> <p>Concept of Computing, Types of Languages: Machine, assembly and High level Language; Operating system as user interface, utility programs.</p> <p>Word processing: Editing features, formatting features, saving, printing, table handling, page settings, spell-checking, macros, mail-merge, equation editors.</p>	10
<p>Unit-III</p> <p>Spreadsheet: Workbook, worksheets, data types, operators, cell formats, freeze panes, editing features, formatting features, creating formulas, using</p>	10

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formulas, cell references, replication, sorting, filtering, functions, Charts & Graphs. Presentation Graphics Software: Templates, views, formatting slide, slides with graphs, animation, using special features, presenting slide shows.	
Unit-IV Electronic Payment System: Secure Electronic Transaction, Types of Payment System: Digital Cash, Electronic Cheque, Smart Card, Credit/Debit Card E-Money, Bit Coins and Crypto currency, Electronic Fund Transfer (EFT), Unified Payment Interface (UPI), Immediate Payment System (IMPS), Digital Signature and Certification Authority. Introduction to Bluetooth, Cloud Computing, Big Data, Data Mining, Mobile Computing and Embedded Systems and Internet of Things (IoT)	12

Text Books:

1. Introduction to Information Technology, IITL 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.
4. IT Tools, R.K. Jain, Khanna Publishing House
5. "Introduction to Information Technology", Satish Jain, Ambrish Rai & Shashi Singh, Paperback Edition, BPB Publications, 2014.

Reference Books:

1. "Introduction to Computers", Peter Norton
2. Computers Today, D. H. Sanders, McGraw Hill.
3. "Computers", Larry long & Nancy long, Twelfth edition, Prentice Hall.
4. Problem Solving Cases in Microsoft Excel, Joseph Brady & Ellen F Monk, Thomson Learning

E Books/ Online learning material

1. www.sakshat.ac.in
 2. <https://swayam.gov.in/course/4067-computer-fundamentals>
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**I. K. Gujral Punjab Technical University Bachelor of
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Course Code: UGCA1903

Course Name: Problem Solving using C

Program: B. Sc. Data Analytics	L: 3 T: 1 P: 0
Branch: Computer Applications	Credits: 4
Semester: 1 st	Contact hours: 44 hours
Internal max. marks: 40	Theory/Practical: Theory
External max. marks: 60	Duration of end semester exam (ESE): 3hrs
Total marks: 100	Elective status: Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	Student should be able to understand the logic building used in Programming.
CO2	Students should be able to write algorithms for solving various real life problems.
CO3	To convert algorithms into programs using C .

Detailed Contents	Contact hours
<p>Unit-I</p> <p>Logic Development: Data Representation, Flowcharts, Problem Analysis, Decision Trees/Tables, Pseudo code and algorithms. Fundamentals: Character set, Identifiers and Key Words, Data types, Constants, Variables, Expressions, Statements, Symbolic Constants.</p> <p>Operations and Expressions: Arithmetic operators, Unary operators, Relational Operators, Logical Operators, Assignment and Conditional Operators, Library functions.</p>	11
<p>Unit-II</p> <p>Data Input and Output: formatted & unformatted input output.</p> <p>Control Statements: While, Do-while and For statements, Nested loops, If-else, Switch, Break – Continue statements.</p>	10
<p>Unit-III</p>	11

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<p>Functions: Brief overview, defining, accessing functions, passing arguments to function, specifying argument data types, function prototypes, recursion.</p> <p>Arrays: Defining, processing arrays, passing arrays to a function, multi-dimensional arrays.</p> <p>Strings: String declaration, string functions and string manipulation Program Structure Storage Class: Automatic, external and static variables.</p>	
<p>Unit-IV</p> <p>Structures & Unions: Defining and processing a structure, user defined data types, structures and pointers, passing structures to functions, unions.</p> <p>Pointers: Understanding Pointers, Accessing the Address of a Variable, Declaration and Initialization of Pointer Variables, Accessing a Variable through its Pointer, Pointers and Arrays</p> <p>File Handling: File Operations, Processing a Data File</p>	12

Text Books:

1. Programming in ANSI C, E. Balagurusami, Fourth Edition, Tata McGraw Hill.
2. Programming in C, Third Edition, Stephen G Kochan, Pearson.
3. The C Programming Language, Kernighan & Ritchie, Second Edition, PHI Publication.

Reference Books:

1. Object Oriented Programming, Lafore R, Third Edition, Galgotia Publications
2. Let us C, Yashvant P Kanetkar, Seventh Edition, BPB Publications, New Delhi.
3. Programming in C, Byron S. Gottfried, Second Edition, McGraw Hills.
4. Problem Solving and Programming in C, R.S. Salaria, Second Edition
5. Programming in C, Atul Kahate.

**I. K. Gujral Punjab Technical University Bachelor of
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Course Code: UGCA1904

Course Name: Workshop on Desktop Publishing

Program: B. Sc. Data Analytics	L: 0 T: 0 P: 4
Branch: Computer Applications	Credits: 2
Semester: 1 st	Contact hours: 4 hours per week
Internal max. marks: 60	Theory/Practical: Practical
External max. marks: 40	Duration of end semester examinations (ESE): 3hrs
Total marks: 100	Elective status: Core

Prerequisite: Students must have basic understanding of designing/ Painting tools.

Co requisite: Printing & Publishing tools.

Additional material required in ESE: Softcopy & Hardcopy of the exercises are to be maintained during the practical labs and to be submitted during the End Semester Examinations.

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

CO#	Course outcomes
CO1	The students will gain professional skills of <i>Desk Top Publishing</i> Tools like designing, Printing & Publishing by using various tools.
CO2	Develop skills in printing jobs through basic understanding of a variety of designing tools.
CO3	Apply these concepts and knowledge in designing field including practice from text formatting to final publishing.
CO4	Workshops are included to enhance professional skills like Brochures, Flexes, Business Cards, Certificates and News Letter layouts etc.

Instructions: Instructor can increase/decrease the experiments as per the requirement.

Assignments:

1.	Design and print a <i>Title Page</i> of a Magazine/Book.
2.	Prepare multiple designs for a <i>Flex</i> by using different Tools.
3.	Prepare <i>NSS Certificates</i> for appreciation using logos of University, College & NSS unit.
4.	Prepare 5 different Designing of <i>Business Cards</i> .
5.	Prepare <i>Envelops</i> displaying full address of the company by inserting graphical symbol/ logos of company.
6.	Design and Print <i>Invoices</i> for three companies.
7.	Prepare and print <i>News Letter Layouts</i> for any five activities of your college/ university.
8.	Prepare <i>Invitation Cards</i> for cultural meet held in your college.

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9.	Design and print <i>Brochures</i> to advertise a “Blood Donation Camp” in your college.
10.	Design <i>Logos</i> of your college, University & Govt. of Punjab also display these logos on black background as water mark.
11.	Design, Print and Publish 5 motivations Playcards.
12.	Design & Print assignment book of minimum 20 Pages an any Topic.
13.	Design & Print any five most important activities of your college in a collage.
14.	Design & Print Question Paper of any Subject.
15.	Assemble all the latest news cutting of your activities on a 10 X 8 size flex.

Reference Books:

1. DTP Course, by Shirish Chavan published by Rapidex.
2. DTP Course Kit by Vikas Gupta published by Comdex.
3. CorelDraw 9 by David Karlins published by Techmedia.
4. Adobe Illustrator CC by Brian Wood published by Adobe Press.
5. Page Maker in Easy Steps - Scott Basham.

Software Tools:

1. Adobe Illustrator 14.
 2. CorelDraw Graphics Suit.
 3. GNU image manipulation program.
 4. Ink Scape.
 5. PhotoScape Setup.
 6. PM701.
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Course Code: UGCA1905

Course Name: Problem Solving using C Laboratory

Program: B. Sc. Data Analytics	L: 0 T: 0 P: 4
Branch: Computer Applications	Credits: 2
Semester: 1 st	Contact hours: 4 hours per week
Internal max. marks: 60	Theory/Practical: Practical
External max. marks: 40	Duration of end semester exam (ESE): 3hrs
Total marks: 100	Elective status: Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course Outcomes
CO1	Students should be able understand the logic building used in programming
CO2	Students should be able to write algorithms for solving various real-life problems
CO3	Students should be able to convert the algorithms into computer programs using C language.

Instructions: Develop all programs in C programming language.

Assignments:

1.	WRITE A PROGRAM to display your name. Write another program to print message with inputted name.
2.	WRITE A PROGRAM to add two numbers.
3.	WRITE A PROGRAM to find the square of a given number.
4.	WRITE A PROGRAM to calculate the average of three real numbers.
5.	Write a program to Find ASCII Value of a Character
6.	WRITE A PROGRAM to Find the Size of int, float, double and char
7.	WRITE A PROGRAM to Compute Quotient and Remainder
8.	WRITE A PROGRAM to accept the values of two variables.
9.	WRITE A PROGRAM to find the simple interest, inputs are amount, period in years and rate of interest.
10.	Basic salary of an employee is input through the keyboard. The DA is 25% of the basic salary while the HRA is 15% of the basic salary. Provident Fund is deducted at the rate of 10% of the gross salary(BS+DA+HRA). WRITE A PROGRAM to calculate the net salary
11.	WRITE A PROGRAM to find area of a circle using PI as constant
12.	WRITE A PROGRAM to find volume of a cube using side as input from user
13.	WRITE A PROGRAM using various unformatted Input Functions

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14.	WRITE A PROGRAM to find area of rectangle and print the result using unformatted output Functions
15.	WRITE A PROGRAM to find the larger of two numbers.
16.	WRITE A PROGRAM to find greater of three numbers using Nested If.
17.	WRITE A PROGRAM to find whether the given number is even or odd.
18.	WRITE A PROGRAM to Generate Multiplication Table Using for loop
19.	WRITE A PROGRAM to Generate Multiplication Table Using while loop
20.	WRITE A PROGRAM to Make a Simple Calculator Using switch...case
21.	WRITE A PROGRAM to find whether the given number is a prime number.
22.	WRITE A PROGRAM using function to find the largest of three numbers
23.	WRITE A PROGRAM using function to print first 20 numbers and its squares.
24.	WRITE A PROGRAM to find the factorial of a given number.
25.	WRITE A PROGRAM to print the sum of two matrices
26.	WRITE A PROGRAM to Find the Length of a String
27.	WRITE A PROGRAM to Copy String using strcpy()
28.	WRITE A PROGRAM to compare a string
29.	WRITE A PROGRAM to reverse a string
30.	WRITE A PROGRAM to reverse a string
31.	WRITE A PROGRAM to multiply two numbers using pointers.
32.	WRITE A PROGRAM to display address of variable using pointers
33.	WRITE A PROGRAM to show the memory occupied by Structure and Union
34.	WRITE A PROGRAM to create Student I-Card using a Structure
35.	WRITE A PROGRAM to read data from a file from a file
36.	WRITE A PROGRAM to save Employee details in a file using File Handling

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Course Code: UGCA1906

Course Name: Fundamentals of Computer and IT Laboratory

Program: B. Sc. Data Analytics	L: 0 T: 0 P: 4
Branch: Computer Applications	Credits: 2
Semester: 1 st	Contact hours: 4 hours per week
Internal max. marks: 60	Theory/Practical: Practical
External max. marks: 40	Duration of end semester exam (ESE): 3hrs
Total marks: 100	Elective status: Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: - NA-

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.

Instructions:

Word Orientation:	
The instructor needs to give an overview of word processor. Details of the four tasks and features that would be covered Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.	
1.	Using word to create Resume Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.
2.	Creating an Assignment Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3.	Creating a Newsletter Features to be covered :- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs
4.	Creating a Feedback form Features to be covered :- Forms, Text Fields, Inserting objects, Mail Merge in Word.
Excel Orientation:	

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The instructor needs to tell the importance of Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered Excel – Accessing, overview of toolbars, saving excel files,	
1.	Creating a Scheduler Features to be covered :- Gridlines, Format Cells, Summation, auto fill, Formatting Text
2.	Calculations Features to be covered :- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP
3.	Performance Analysis Features to be covered :- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting
4.	Game (like Cricket, badminton) Score Card Features to be covered :- Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation
Presentation Orientation:	
1.	Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows
2.	This session helps students in making their presentations interactive. Topics covered includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts
3.	Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topics covered includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides. Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing
4.	Power point test would be conducted. Students will be given model power point presentation which needs to be replicated
Internet and its Applications	
The instructor needs to tell the how to configure Web Browser and to use search engines by defining search criteria using Search Engines	
1.	To learn to setup an e-mail account and send and receive e-mails
2.	To learn to subscribe/post on a blog and to use torrents for accelerated downloads
3.	Hands on experience in online banking and Making an online payment for any domestic bill

Reference Books:

1. IT Tools, R.K. Jain, Khanna Publishing House.

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2. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
 3. Introduction to information technology, Turban, Rainer and Potter, John Wiley and Sons.
 4. Problem Solving Cases in Microsoft Excel, Joseph Brady & Ellen F Monk, Thomson Learning.
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**AECC (For UGC courses)
BTHU103-18 English:**

Course Outcomes:

- The objective of this course is to introduce students to the theory, fundamentals and tools of communication.
- To help the students become the independent users of English language.
- To develop in them vital communication skills which are integral to their personal, social and professional interactions.
- The syllabus shall address the issues relating to the Language of communication.
- Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills such as report writing, note taking etc.

The recommended readings given at the end are only suggestive; the students and teachers have the freedom to consult other materials on various units/topics given below. Similarly, the questions in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommended books.

Detailed Contents:

Unit1- 1 (Introduction)

- Theory of Communication
- Types and modes of Communication

Unit- 2 (Language of Communication)

- Verbal and Non-verbal
- (Spoken and Written)
- Personal, Social and Business
- Barriers and Strategies
- Intra-personal, Inter-personal and Group communication

Unit-3 (Reading and Understanding)

- Close Reading
- Comprehension
- Summary Paraphrasing

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- Analysis and Interpretation
- Translation(from Hindi/Punjabi to English and vice-versa)

OR

Precis writing /Paraphrasing (for International Students)

- Literary/Knowledge Texts

Unit-4 (Writing Skills)

- Documenting
- Report Writing
- Making notes
- Letter writing

Recommended Readings:

1. *Fluency in English* - Part II, Oxford University Press, 2006.
 2. *Business English*, Pearson, 2008.
 3. *Language, Literature and Creativity*, Orient Blackswan, 2013.
 4. *Language through Literature* (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brati Biswas
 5. *On Writing Well*. William Zinsser. Harper Resource Book. 2001
 6. *Study Writing*. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
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**AECC
BTHU104/18 English Practical/Laboratory
: 0L 0T 2P 1 Credit**

Course Outcomes:

- The objective of this course is to introduce students to the theory, fundamentals and tools of communication.
- To help the students become the independent users of English language.
- To develop in them vital communication skills which are integral to personal, social and professional interactions.
- The syllabus shall address the issues relating to the Language of communication.
- Students will become proficient in professional communication such as interviews, group discussions and business office environments, important reading skills as well as writing skills such as report writing, note taking etc.

The recommended readings given at the end are only suggestive; the students and teachers have the freedom to consult other materials on various units/topics given below. Similarly, the questions in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommended books.

Interactive practice sessions in Language Lab on Oral Communication

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- Listening Comprehension
- Self Introduction, Group Discussion and Role Play
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations
- Monologue
- Effective Communication/ Mis- Communication
- Public Speaking

Recommended Readings:

1. *Fluency in English* - Part II, Oxford University Press, 2006.
 2. *Business English*, Pearson, 2008.
 3. *Practical English Usage*. Michael Swan. OUP. 1995.
 4. *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
 5. *Exercises in Spoken English*. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
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Course Code: HVPE101-18

Course Name: Human Values, De-addiction and Traffic Rules

Program: B. Sc. Data Analytics	L: 3 T: 0 P: 0
Branch: Computer Applications	Credits: 3
Semester: 1 st	Contact hours: 33 hours
Internal max. marks: 40	Theory/Practical: Theory
External max. marks: 60	Duration of end semester exam (ESE): 3hrs
Total marks: 100	Elective status: Ability Enhancement

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

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Science in Data Analytic (B Sc. Data Analytics)**

CO2	To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.
CO3	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Note: This course is intended to provide a much needed orientational input in Value Education to the young enquiring minds.

Detailed Contents	Contact hours
<p>Unit-I</p> <p>Course Introduction - Need, Basic Guidelines, Content and Process for Value Education</p> <ol style="list-style-type: none"> Understanding the need, basic guidelines, content and process for Value Education Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfill the above human aspirations: understanding and living in harmony at various levels 	8
<p>Unit-II</p> <p>Understanding Harmony in the Human Being - Harmony in Myself!</p> <ol style="list-style-type: none"> Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’ Understanding the needs of Self (‘I’) and ‘Body’ - <i>Sukh</i> and <i>Suvidha</i> Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer) Understanding the characteristics and activities of ‘I’ and harmony in ‘I’ 	8

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<p>5. Understanding the harmony of I with the Body: <i>Sanyam</i> and <i>Swasthya</i>; correct appraisal of Physical needs, meaning of Prosperity in detail</p> <p>6. Programs to ensure <i>Sanyam</i> and <i>Swasthya</i> - Practice Exercises and Case Studies will be taken up in Practice Sessions.</p>	
<p>Unit-III</p> <p>Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship</p> <p>1. Understanding harmony in the Family- the basic unit of human interaction</p> <p>2. Understanding values in human-human relationship; meaning of <i>Nyaya</i> and program for its fulfillment to ensure <i>Ubhay-tripti</i>; Trust (<i>Vishwas</i>) and Respect (<i>Samman</i>) as the foundational values of relationship</p> <p>3. Understanding the meaning of <i>Vishwas</i>; Difference between intention and competence</p> <p>4. Understanding the meaning of <i>Samman</i>, Difference between respect and differentiation; the other salient values in relationship</p> <p>5. Understanding the harmony in the society (society being an extension of family): <i>Samadhan</i>, <i>Samridhi</i>, <i>Abhay</i>, <i>Sah-astitva</i> as comprehensive Human Goals</p> <p>6. Visualizing a universal harmonious order in society- Undivided Society (<i>Akhand Samaj</i>), Universal Order (<i>Sarvabhaum Vyawastha</i>)- from family to world family! - Practice Exercises and Case Studies will be taken up in Practice Sessions.</p>	6
<p>Unit-IV</p> <p>Understanding Harmony in the Nature and Existence - Whole existence as Co-existence</p> <p>1. Understanding the harmony in the Nature</p> <p>2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature</p> <p>3. Understanding Existence as Co-existence (<i>Sah-astitva</i>) of mutually interacting units in all-pervasive space</p> <p>4. Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions.</p>	5
<p>Unit-V</p>	6

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<p>Implications of the above Holistic Understanding of Harmony on Professional Ethics</p> <ol style="list-style-type: none">1. Natural acceptance of human values2. Definitiveness of Ethical Human Conduct3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order4. Competence in professional ethics:<ol style="list-style-type: none">a) Ability to utilize the professional competence for augmenting universal human order,b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,c) Ability to identify and develop appropriate technologies and management patterns for above production systems.5. Case studies of typical holistic technologies, management models and production systems6. Strategy for transition from the present state to Universal Human Order:<ol style="list-style-type: none">a) At the level of individual: as socially and ecologically responsible engineers, technologists and managersb) At the level of society: as mutually enriching institutions and organizations.	
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Text Book

1. R R Gaur, R Sangal, G P Bagaria, 2009, *A Foundation Course in Value Education*.

Reference Books

1. Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and Harper Collins, USA.
2. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
3. A Nagraj, 1998, *Jeevan Vidya ek Parichay*, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986, 1991.
5. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Common wealth Publishers.
6. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.
7. Subhas Palekar, 2000, *How to practice Natural Farming*, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *Limits to Growth – Club of Rome’s report*, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, *Fundamentals of Ethics for Scientists & Engineers*, Oxford University Press

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10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, *Engineering Ethics (including Human Values)*, Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, *Foundations of Ethics and Management*, Excel Books.
12. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, <http://uhv.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology – the Untold Story*

Course Code: HVPE102-18

Course Name: Human Values, De-addiction and Traffic Rules (Lab/ Seminar)

Program: B. Sc. Data Analytics	L: 0 T: 0 P: 1
Branch: Computer Applications	Credits: 1
Semester: 1 st	Contact hours: 1 hour per week
Internal max. marks: 25	Theory/Practical: Practical
External max. marks: 0	Duration of end semester exam (ESE): 3hrs
Total marks: 25	Elective status: Ability Enhancement

One each seminar will be organized on Drug De-addiction and Traffic Rules. Eminent scholar and experts of the subject will be called for the Seminar at least once during the semester. It will be binding for all the students to attend the seminar.

**I. K. Gujral Punjab Technical University Bachelor of
Science in Data Analytic (B Sc. Data Analytics)**

Course Code: UGCA1985

Course Name: Probability and Statistics

Program: B. Sc. Data Analytics	L: 3 T: 1 P: 0
Branch: Computer Applications	Credits: 4
Semester: 2 nd	Contact hours: 44 hours
Internal max. marks: 40	Theory/Practical: Theory
External max. marks: 60	Duration of end semester exam (ESE): 3hrs
Total marks: 100	Elective status: Core

Prerequisite: Students must have the basic knowledge of mathematic terms.

Co requisite: NA

Additional material required in ESE: Minimum two exercises of each concept will be recorded in the file and the file will be submitted in End Semester Examinations.

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

CO#	Course Outcomes
CO1	Understand the science of studying & analyzing numbers.
CO2	Define probability.
CO3	Describe various statistical formulas.
CO4	Compute various statistical measures.

Detailed Contents	Contact hours
<p>Unit I</p> <p>Define probability, Random experiment, outcome, trial and event, Exhaustive events, favourable events, Independent events, sample space, definition of probability, addition theorem of probability, conditional probability, independent events, Mutually and pair wise independent events, multiplication theorem of probability for independent events, Baye's theorem.</p>	11 hours
<p>Unit II</p> <p>Random Variable (Univariate): Random Variable, Distribution function, discrete random variable, Probability mass function, Distribution function of discrete random variable, Continuous random variable, Probability density function. Distribution function of continuous random variable. Two dimensional probability mass function, Marginal probability function, conditional probability function, Two dimensional distribution function, marginal distribution function, Joint density function, marginal density function.</p>	11 hours

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<p>Unit III</p> <p>Define statistics, Measures of Central tendency: Introduction to Central Tendency, Purpose and Functions of Average, Characteristics of a Good Average, Types of Averages, Meaning of Arithmetic Mean, Calculation of Arithmetic Mean, Merit and Demerits of Arithmetic Mean, Meaning of Median, Calculation of Median, Merit and Demerits of Median, Meaning of Mode, Calculation of Mode, Merit and Demerits of Mode, Harmonic Mean- Properties- Merit and Demerits.</p>	<p align="center">11 hours</p>
<p>Unit IV</p> <p>Measures of Dispersion: Meaning of Dispersion, Objectives of Dispersion, Properties of a good Measure of Dispersion, Methods of Measuring Dispersion, Range Introduction, Calculation of Range , Merit and Demerits of Range, Mean Deviation, Calculation of Mean Deviation , Merit and Demerits of Mean Deviation, Standard Deviation Meaning, Calculation of Standard Deviation , Merit and Demerits of Standard Deviation, Coefficient of Variation, Calculation of Coefficient Variance, Merit and Demerits of Coefficient of Variation.</p>	<p align="center">11 hours</p>

Text Books:

1. Statistics and Data Analysis, A.Abebe, J. Daniels, J.W.Mckean, December 2000.
2. Statistics, Tmt. S. EzhilarasiThiru, 2005, Government of Tamilnadu.
3. Introduction to Statistics, David M. Lane.
4. Weiss, N.A., Introductory Statistics. Addison Wesley, 1999.
5. Clarke, G.M. & Cooke, D., A Basic course in Statistics. Arnold, 1998.

Reference Books:

1. Banfield J.(1999), Rweb: Web-based Statistical Analysis, Journal of Statistical Software.
2. Bhattacharya,G.K. and Johnson, R.A.(19977), Statistical Concepts and Methods, New York, John Wiley & Sons.

E-Books/ Online learning material

1. http://onlinestatbook.com/Online_Statistics_Education.pdf
2. <https://textbookcorp.tn.gov.in/Books/12/Std12-Stat-EM.pdf>
3. <https://3lihandam69.files.wordpress.com/2015/10/introductorystatistics.pdf>

**I. K. Gujral Punjab Technical University Bachelor of
Science in Data Analytic (B Sc. Data Analytics)**

Course Code: UGCA1922

Course Name: Database Management Systems

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

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes: Students will be able to

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
<p>Unit-I</p> <p>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 and Relational Model, Entity Relationship Model.</p>	10
<p>Unit-II</p> <p>Relational Database, Relational Algebra and Calculus, SQL Fundamentals, DDL, DML, DCL, PL/SQL Concepts, Cursors, Stored Procedures, Stored Functions, Database Triggers.</p>	12
<p>Unit-III</p> <p>Introduction to Normalization, First, Second, Third Normal Forms, Dependency Preservation, Boyce-Codd Normal Form, Multi-valued</p>	12

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Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Domain-key normal form (DKNF).	
Unit-IV Database Recovery, Concurrency Management, Database Security, Integrity and Control. Structure of a Distributed Database, Design of Distributed Databases.	10

Text Books:

1. "An Introduction to Database System", Bipin C. Desai, Galgotia Publications Pvt Ltd-New Delhi, Revised Edition, (2012).
2. "Database System Concepts", Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Tata McGraw Hill, 6th Edition, (2013).

Reference Books:

1. "SQL, PL/SQL The Programming Language of Oracle", Ivan Bayross, BPB Publications, 4th Revised Edition (2009)
2. "An Introduction to Database Systems", C. J. Date, A. Kannan, S. Swamynathan, 8th Edition, Pearson Education, (2006).
3. Database Management Systems, Raghu Ramakrishnan, McGraw-Hill, Third Edition, 2014.

Course Code: UGCA1909

Course Name: Object Oriented Programming using C++

Program: B. Sc. Data Analytics	L: 3 T: 1 P: 0
Branch: Computer Applications	Credits: 4
Semester: 2 nd	Contact hours: 44 hours
Internal max. marks: 40	Theory/Practical: Theory
External max. marks: 60	Duration of end semester exam (ESE): 3hrs
Total marks: 100	Elective status: Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	To learn programming from real world examples.

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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
<p>Unit-I</p> <p>Principles of object oriented programming Introduction to OOP and its basic features, Basic components of a C++, Program and program structure, Compiling and Executing C++ Program. Difference between Procedure Oriented Language(C) and Object Oriented Language</p>	12
<p>Unit-II</p> <p>Classes & Objects and Concept of Constructors Defining classes, Defining member functions, Declaration of objects to class, Access to member variables from objects, Different forms of member functions, Access specifiers (Private, public, protected), Array of objects.</p> <p>Introduction to constructors, Parameterized constructors, Copy Constructor, Multiple constructors in class, Dynamic initialization of objects, Destructors.</p>	10
<p>Unit-III</p> <p>Inheritance and Operator overloading Introduction to Inheritance, Types of inheritance: - Single inheritance, Multiple inheritance, Multilevel inheritance, Hierarchical inheritance, Hybrid inheritance, Defining operator overloading, Overloading of Unary and Binary operators, Rules for overloading operators</p>	12
<p>Unit-IV</p> <p>Polymorphism and File Handling Early Binding, Late Binding, Virtual Functions, pure virtual functions, Abstract Classes.</p> <p>Opening and Closing File, Reading and Writing a file.</p>	10

Text Books:

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1. Object Oriented Programming with C++, E. Balagurusami, Fourth Edition, Tata Mc-Graw Hill.
 2. Object Oriented Programming in Turbo C++, Robert Lafore, Fourth Edition Galgotia Publications.
 3. The C++ Programming Language, Bjarna Stroustrup, Third Edition, Addison-Wesley Publishing Company.
 4. Object Oriented Programming Using C++, Salaria, R. S, Fourth Edition, Khanna Book Publishing.
-

Course Code: UGCA1910

Course Name: Object Oriented Programming using C++ Laboratory

Program: B. Sc. Data Analytics	L: 0 T: 0 P: 4
Branch: Computer Applications	Credits: 2
Semester: 2 nd	Contact hours: 4 hours per week
Internal max. marks: 60	Theory/Practical: Practical
External max. marks: 40	Duration of end semester exam (ESE): 3hrs
Total marks: 100	Elective status: Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

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

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Instructions: Develop all program in C++

Assignments:

1.	Write a program to enter mark of 6 different subjects and find out the total mark (Using cin and cout statement)
2.	Write a function using reference variables as arguments to swap the values of pair of integers.
3.	Write a function to find largest of three numbers.
4.	Write a program to find the factorial of a number.
5.	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: a) To assign initial values b) To deposit an amount c) To withdraw an amount after checking the balance d) To display name and balance.
6.	Write the above program for handling n number of account holders using array of objects.
7.	Write a C++ program to compute area of right angle triangle, equilateral triangle, isosceles triangle using function overloading concept.
8.	Consider a publishing company that markets both book and audio cassette version to its works. Create a class Publication that stores the title (a string) and price (type float) of a publication. Derive the following two classes from the above Publication class: Book which adds a page count (int) and Tape which adds a playing time in minutes(float). Each class should have get_data() function to get its data from the user at the keyboard. Write the main() function to test the Book and Tape classes by creating instances of them asking the user to fill in data with get_data() and then displaying it using put_data().
9.	Consider an example of declaring the examination result. Design three classes student, exam and result. The student has data members such as rollno, name. Create the class exam by inheriting the student class. The exam class adds data members representing the marks scored in 5 subjects. Derive the result from exam-class and it has own data members like total, avg.
10.	Write a program for overloading of Unary ++ operator.
11.	Write a program for overloading of Binary + operator.
12.	Write a program of Virtual Functions.
13.	Write a program of Abstract Classes.
14.	Write a program to read and write from file.

Reference Books:

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1. Object Oriented Programming with C++, E. Balagurusami, Fourth Edition, Tata Mc-Graw Hill.
 2. Object Oriented Programming in Turbo C++, Robert Lafore, Fourth Edition Galgotia Publications.
 3. The C++ Programming Language, Bjarna Stroustrup, Third Edition, Addison-Wesley Publishing Company.
 4. Object Oriented Programming Using C++, Salaria, R. S, Fourth Edition, Khanna Book Publishing.
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Course Code: UGCA1986

Course Name: Probability and Statistics Laboratory

Program: B. Sc. Data Analytics	L: 0 T: 0 P: 4
Branch: Computer Applications	Credits: 2
Semester: 2 nd	Contact hours: 4 hours per week
Internal max. marks: 60	Theory/Practical: Practical
External max. marks: 40	Duration of end semester exam (ESE): 3hrs
Total marks: 100	Elective status: Core

Prerequisite:NA.

Co requisite: NA.

Additional material required in ESE:.

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

CO#	Course Outcomes
CO1	Installation and use of open source statistical tool.
CO2	Apply various operations/ formulas using open source statistical tool.

Instructions:

1. Installation of any open source statistical tool.
2. Implementation of various measures of central tendency.
3. Implementation of various measures of dispersion.
4. Implementation of probability functions.

Reference Books:

1. Statistics for Economics, TR Jain, VK Ohri.
2. Statistics and Data Analysis, A.Abebe, J. Daniels, J.W.Mckean, December 2000.

E-Books/ Online learning material

1. https://www.meritnation.com/cbse-class-11-commerce/economics/class_13_tr_jain.

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2. http://college.cengage.com/mathematics/brase/understandable_statistics/97_80618949922_ch03.pdf
3. http://www.rockcreekschools.org/pages/uploaded_files/Excel%20%20Lab%20Exercises.pdf

Course Code: UGCA1925

Course Name: Database Management Systems Laboratory

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

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	Able to understand various queries and their execution
CO2	Populate and query a database using SQL DML/DDI 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

Instructions:

1.	Used of CREATE, ALTER, RENAME and DROP statement in the database tables (relations)
2.	Used of INSERT INTO, DELETE and UPDATE statement in the database tables (relations)
3.	Use of simple select statement.
4.	Use of select query on two relations
5.	Use of nesting of queries.
6.	Use of aggregate functions.
7.	Use of substring comparison.
8.	Use of order by statement.
9.	Consider the following schema for a Library Database:

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	<p>BOOK (<i>Book_id, Title, Publisher_Name, Pub_Year</i>) BOOK_AUTHORS (<i>Book_id, Author_Name</i>) PUBLISHER (<i>Name, Address, Phone</i>) BOOK_COPIES (<i>Book_id, Branch_id, No-of_Copies</i>) BOOK_LENDING (<i>Book_id, Branch_id, Card_No, Date_Out, Due_Date</i>) LIBRARY_BRANCH (<i>Branch_id, Branch_Name, Address</i>)</p> <p>Write SQL queries to</p> <ol style="list-style-type: none"> 1. Retrieve details of all books in the library_id, title, name of publisher, authors, number of copies in each branch, etc. 2. Get the particulars of borrowers who have borrowed more than 3 books between Jan 2018 to Jun 2018 3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation. 4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query. 5. Create a view of all books and its number of copies that are currently available in the Library.
10.	<p>Consider the following schema for Order Database: SALESMAN (<i>Salesman_id, Name, City, Commission</i>) CUSTOMER (<i>Customer_id, Cust_Name, City, Grade, Salesman_id</i>) ORDERS (<i>Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id</i>)</p> <p>Write SQL queries to</p> <ol style="list-style-type: none"> 1. Count the customers with grades above Amritsar’s average. 2. Find the name and numbers of all salesmen who had more than one customer. 3. List all salesmen and indicate those who have and don’t have customers in their cities (Use UNION operation.) 4. Create a view that finds the salesman who has the customer with the highest order of a day. 5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.
11.	Write a PL/SQL code to add two numbers and display the result. Read the numbers during run time.
12.	Write a PL/SQL code to find sum of first 10 natural numbers using while and for loop.
13.	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.
14.	Write a PL/SQL block to count the number of rows affected by an update statement using SQL%ROWCOUNT
15.	Write a PL/SQL block to increase the salary of all doctors by 1000.

Reference Books:

1. “SQL, PL/SQL The Programming Language of Oracle”, 4th Revised Edition, Ivan Bayross (2009).

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2. “Oracle PL/SQL Programming”, 5th Edition, Steven Feuerstein and Bill Pribyl (2009).
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**Ability Enhancement Compulsory Course
EVS102-18 Environmental Studies**

Course Outcomes:

1. Students will enable to understand environmental problems at local and national level through literature and general awareness.
2. The students will gain practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.
3. The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate these problems.
4. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world

UNIT-1: Introduction to Environmental Studies

Multidisciplinary nature of Environmental Studies: Scope & Importance
Need for Public Awareness

UNIT-2: Ecosystems

Concept of an Ecosystem: Structure & functions of an ecosystem (Producers, Consumers & Decomposers)

Energy Flow in an ecosystem: Food Chain, Food web and Ecological Pyramids

Characteristic features, structure & functions of following Ecosystems:

- Forest Ecosystem
- Aquatic Ecosystem (Ponds, Lakes, River & Ocean)

UNIT-3: Natural Resources

Renewable & Non-renewable resources

Forest Resources: Their uses, functions & values (Biodiversity conservation, role in climate change, medicines) & threats (Overexploitation, Deforestation, Timber extraction, Agriculture Pressure), Forest Conservation Act

Water Resources: Their uses (Agriculture, Domestic & Industrial), functions & values, Overexploitation and Pollution of Ground & Surface water resources (Case study of Punjab), Water Conservation, Rainwater Harvesting,

Land Resources: Land as a resource; Land degradation, soil erosion and desertification

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Energy Resources: Renewable & non-renewable energy resources, use of alternate energy resources (Solar, Wind, Biomass, Thermal), Urban problems related to Energy

UNIT-4: Biodiversity & its conservation

Types of Biodiversity: Species, Genetic & Ecosystem

India as a mega biodiversity nation, Biodiversity hot spots and biogeographic regions of India

Examples of Endangered & Endemic species of India, Red data book

UNIT-5: Environmental Pollution & Social Issues

Types, Causes, Effects & Control of Air, Water, Soil & Noise Pollution

Nuclear hazards and accidents & Health risks

Global Climate Change: Global warming, Ozone depletion, Acid rain, Melting of Glaciers & Ice caps, Rising sea levels

Environmental disasters: Earthquakes, Floods, Cyclones, Landslides

UNIT-6: Field Work

Visit to a National Park, Biosphere Reserve, Wildlife Sanctuary

Documentation & preparation of a Biodiversity (flora & fauna) register of campus/river/forest

Visit to a local polluted site: Urban/Rural/Industrial/Agricultural

Identification & Photography of resident or migratory birds, insects (butterflies)

Public hearing on environmental issues in a village

Suggested Books:

1. Bharucha, E. Text Book for Environmental Studies. University Grants Commission, New Delhi.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clarendon Press Oxford (TB)
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down to Earth, Centre for Science and Environment (R)
9. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
10. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
11. Heywood, V.H & Weston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
12. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.

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13. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
 14. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
 15. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
 16. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
 17. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
 18. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
 19. Survey of the Environment, The Hindu (M)
 20. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
 21. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
 22. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p
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Course Code: UGCA1923

Course Name: Operating Systems

Program: B. Sc. Data Analytics	L: 3 T: 1 P: 0
Branch: Computer Applications	Credits: 4
Semester: 3 rd	Contact hours: 44 hours
Theory/Practical: Theory	Percentage of numerical/design problems: 15%
Internal max. marks: 40	Duration of end semester exam (ESE): 3hrs
External max. marks: 60	Elective status: Core
Total marks: 100	

Prerequisite: Basic understanding of computer system.

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes: Students will be able to:

CO#	Course outcomes
CO1	Discuss the evaluation of operating systems.
CO2	Explain different resource managements performed by operating system.
CO3	Describe the architecture in terms of functions performed by different types of operating systems.
CO4	Analyze the performance of different algorithms used in design of operating system components.
CO5	Compare the key properties of different types of Operating Systems.

Detailed contents Page 37 of	Contact hours
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<p>Unit-I</p> <p>Fundamentals of Operating system: Introduction to Operating system, Functions of an operating system. Operating system as a resource manager. Structure of operating system (Role of kernel and Shell). Views of operating system. Evolution and types of operating systems.[CO1]</p> <p>Process & Thread Management: Program vs. Process; PCB, State transition diagram, Scheduling Queues, Types of schedulers, Concept of Thread, Benefits, Types of threads, Process synchronization. [CO2]</p> <p>CPU Scheduling: Need of CPU scheduling, CPU I/O Burst Cycle, Pre-emptive vs. Non-pre-emptive scheduling, Different scheduling criteria's, scheduling algorithms (FCFS, SJF, Round-Robin, Multilevel Queue). [CO2]</p>	12
<p>Unit-II</p> <p>Memory Management: Introduction, address binding, relocation, loading, linking, memory sharing and protection; Paging and segmentation; Virtual memory: basic concepts of demand paging, page replacement algorithms. [CO2]</p>	12
<p>Unit-III</p>	08
<p>I/O Device Management: I/O devices and controllers, device drivers; disk storage.</p> <p>File Management: Basic concepts, file operations, access methods, directory structures and management, remote file systems; file protection.[CO3]</p>	
<p>Unit-IV</p> <p>Advanced Operating systems: Introduction to Distributed Operating system, Characteristics, architecture, Issues, Communication & Synchronization; Introduction Multiprocessor Operating system, Architecture, Structure, Synchronization & Scheduling; Introduction to Real-Time Operating System, Characteristics, Structure & Scheduling. Case study of Linux operating system [CO4] [CO5]</p>	12

Text Books:

**I. K. Gujral Punjab Technical University Bachelor of
Science in Data Analytic (B Sc. Data Analytics)**

Edition, Published by Wiley-India.

- Principals of Operating System by Naresh Chauhan, Published by OXFORD University Press, India.

Reference Books:

- Operating Systems by Sibsankar Haldar and Alex A. Aravind, Published by Pearson Education.
 - Operating system by Stalling, W., Sixth Edition, Published by Prentice Hall(India)
- -----

Course Code: UGCA1931

Course Name: Data Warehouse and Mining

Program: B. Sc. Data Analytics	L: 3 T: 0 P: 0
Branch: Computer Applications	Credits: 3
Semester: 3rd	Contact hours: 44 hours
Theory/Practical: Theory	Percentage of numerical/design problems: 20%
Internal max. marks: 40	Duration of end semester exam (ESE): 3hrs
External max. marks: 60	Elective status: Elective
Total marks: 100	

Prerequisite: -NA-Co requisite: -NA-

Additional material required in ESE: -NA-

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

CO#	Course outcomes
CO1	Explain the need of Data Warehousing & Mining
CO2	Evaluate the Transactional and Analytical data models.
CO3	Analyze the real-life applications where data mining can be applied.
CO4	Apply different data mining algorithms on wide range of data sets.

Detailed Contents	Contact hours
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Science in Data Analytic (B Sc. Data Analytics)**

<p>Unit-I</p> <p>Need for strategic information, difference between operational and Informational data stores</p> <p>Data warehouse definition, characteristics, Data warehouse role and structure, OLAP Operations, Data mart, Different between data mart and data warehouse, Approaches to build a data warehouse, Building a data warehouse, Metadata & its types.</p>	<p align="center">11</p>
<p>Unit-II</p> <p>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.</p> <p>Data warehouse architecture, OLAP servers, Indexing OLAP Data, OLAP query processing, Data cube computation</p>	<p align="center">11</p>
<p>Unit-III</p> <p>Data Mining: Definition, Data Mining process, Data mining methodology, Data mining tasks, Mining various Data types & issues.</p>	<p align="center">12</p>
<p>Attribute-Oriented Induction, Association rule mining, Frequent itemset mining, The Apriori Algorithm, Mining multilevel association rules.</p>	
<p>Unit-IV</p> <p>Overview of classification, Classification process, Decision tree, Decision Tree Induction, Attribute Selection Measures. Overview of classifier's accuracy, Evaluating classifier's accuracy, Techniques for accuracy estimation, Increasing the accuracy of classifier.</p> <p>Introduction to Clustering, Types of clusters, Clustering methods, Data visualization & various data visualization tools</p>	<p align="center">10</p>
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Berson, Data Warehousing, Data Mining & OLAP, Tata McGraw- Hill. 2. Han J., Kamber M. and Pei J., Data mining concepts and techniques, MorganKaufmann 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. <hr/> <p align="center">Page 40 of</p>	

**I. K. Gujral Punjab Technical University Bachelor of
Science in Data Analytic (B Sc. Data Analytics)**

Course Code: UGCA1915

Course Name: Data Structures

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

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>Unit-I</p> <p>Introduction to Data Structures: Algorithms and Flowcharts, Basics Analysis on Algorithm, Complexity of Algorithm, Introduction and Definition of Data Structure, Classification of Data, Arrays, Various types of Data Structure, Static and Dynamic Memory Allocation, Function, Recursion. [CO5]</p> <p>Arrays, Pointers and Strings: Introduction to Arrays, Definition, One Dimensional Array and Multi-Dimensional Arrays, Pointer, Pointer to Structure, various Programs for Array and Pointer. Strings. Introduction to Strings, Definition, Library Functions of Strings. [CO1]</p>	10

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<p>Unit-II</p> <p>Stacks and Queue Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack and Multiple Stacks. Implementation of Multiple Stack Queues, Introduction to Queue, Definition, Queue Implementation, Operations of Queue, Circular Queue, De-queue and Priority Queue. [CO2]</p>	8
<p>Unit-III</p> <p>Linked Lists and Trees Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, And Circular Doubly Linked List. [CO3]</p> <p>Trees Introduction to Tree, Tree Terminology Binary Tree, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree B Tree, B+ Tree. [CO3]</p>	14
<p>Unit-IV</p> <p>Graphs, Searching, Sorting and Hashing Graphs: Introduction, Representation to Graphs, Graph Traversals Shortest Path Algorithms. [CO3]</p> <p>Searching and Sorting: Searching, Types of Searching, Sorting, Types of sorting like quick sort, bubble sort, merge sort, selection sort. [CO4]</p> <p>Hashing: Hash Function, Types of Hash Functions, Collision, Collision Resolution Technique (CRT), Perfect Hashing [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
- 3. Aho Alfred V., Hopperoft John E., Ullman Jeffrey D., "Data Structures and Algorithms", Addison Wesley

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.

**I. K. Gujral Punjab Technical University Bachelor of
Science in Data Analytic (B Sc. Data Analytics)**

Course Code: UGCA1914

Course Name: Programming in Python

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

Prerequisite: -NA-Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes: Students will be able to:

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
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Science in Data Analytic (B Sc. Data Analytics)**

<p>Unit-I</p> <p>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. [CO1] [CO2]</p> <p>Python Data Types & 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]</p> <p>Operators and Expressions: Operators in Python, Expressions, Precedence, Associativity of Operators, Non Associative Operators. [CO1]</p>	<p align="center">12</p>
<p>Unit-II</p> <p>Control Structures: Decision making statements, Python loops, Python control statements.</p> <p>Python Native Data Types: Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).[CO3]</p>	<p align="center">10</p>
<p>Unit-III</p> <p>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. [CO3]</p> <p>Python Modules: Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages. [CO3]</p>	<p align="center">12</p>
<p>Unit-IV</p> <p>Exception Handling: Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python.</p>	<p align="center">10</p>

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<p>File Management in Python: Operations on files (opening, modes, attributes, encoding, closing), read() & write() methods, tell() & seek() methods, renaming & deleting files in Python, directories in Python. [CO4]</p>	
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<p>Classes and Objects: The concept of OOPS in Python, Designing classes, Creating objects, Accessing attributes, Editing class attributes, Built-in class attributes, Garbage collection, Destroying objects. [CO5]</p>	
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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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**I. K. Gujral Punjab Technical University Bachelor of
Science in Data Analytic (B Sc. Data Analytics)**

Course Code: UGCA1926

Course Name: Operating Systems Laboratory

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

Prerequisite: -NA-Co requisite:

-NA-

Additional material required in ESE: -NA-

Course Outcomes: After going through the practical, student will be able to:

CO#	Course outcomes
CO1	Implement the installation and configuration of different operating systems.
CO2	Write programs for different scheduling algorithms.
CO3	Execute various commands in Vi editor
CO4	Implement the dual boot installation
CO5	Execute commands in shell programming

Instructions:

1	Installation of windows OS.
2	Installation of Linux OS.
3	Dual boot installation of Operating systems.
4	Implementation of FCFS Scheduling algorithm
5	Implementation of SJF Scheduling algorithm
6	Implementation of Round-Robin Scheduling algorithm
7	Vi Editor & its commands
8	Shell Commands
9	Shell Scripting- Using variables
10	Shell Scripting- Input & Output
11	Shell Scripting- Data types
12	Shell Scripting- Use of arithmetic operators
13	Shell Scripting- if control statement programs
14	Shell Scripting- while control statement
15	Shell Scripting- for control statement

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Science in Data Analytic (B Sc. Data Analytics)**

Reference Books:

Linux: The complete reference by Richard Petersen, Published by Tata McGraw-Hill Publication.
Operating System Principles by Abraham Silberschatz and Peter Baer Galvin, Seventh Edition,
Published by Wiley-India.

Course Code: UGCA1917

Course Name: Programming in Python Laboratory

Program: B. Sc. Data Analytics	L: 0 T: 0 P:4
Branch: Computer Applications	Credits: 2
Semester: 3 rd	Contact hours: 4 hours per week
Theory/Practical: Practical	Percentage of numerical/design problems: 90%
Internal max. marks: 60	Duration of end semester exam (ESE): 3hrs
External max. marks: 40	Elective Status : Core
Total marks: 100	

Prerequisite: -NA-Co requisite: -NA-

Additional material required in ESE: - Maintain practical note book as per the instructions given by the instructor.

Course Outcomes: Students will be able to :

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.

List of assignments:

1.	Compute sum, subtraction, multiplication, division and exponent of given variables input by the user.
2.	Compute area of following shapes: circle, rectangle, triangle, square, trapezoid and parallelogram.
3.	Compute volume of following 3D shapes: cube, cylinder, cone and sphere.
4.	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.
5.	Print numbers up to N which are not divisible by 3, 6, 9,, e.g., 1, 2, 4, 5, 7,....
6.	Write a program to determine whether a triangle is isosceles or not?
7.	Print multiplication table of a number input by the user.
8.	Compute sum of natural numbers from one to n number.

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9.	Print Fibonacci series up to n numbers e.g. 0 1 1 2 3 5 8 13.....n
10.	Compute factorial of a given number.
11.	Count occurrence of a digit 5 in a given integer number input by the user.
12.	Print Geometric and Harmonic means of a series input by the user.
13.	Evaluate the following expressions: a. $x-x^2/2!+x^3/3!- x^4/4!+\dots x^n/n!$ b. $x-x^3/3!+x^5/5!- x^7/7!+\dots x^n/n!$
14.	Print all possible combinations of 4, 5, and 6.
15.	Determine prime numbers within a specific range.
16.	Count number of persons of age above 60 and below 90.
17.	Compute transpose of a matrix.
18.	Perform following operations on two matrices. 1) Addition 2) Subtraction 3) Multiplication
19.	Count occurrence of vowels.
20.	Count total number of vowels in a word.
21.	Determine whether a string is palindrome or not.
22.	Perform following operations on a list of numbers: 1) Insert an element 2) delete an element 3) sort the list 4) delete entire list
23.	Display word after Sorting in alphabetical order.
24.	Perform sequential search on a list of given numbers.
25.	Perform sequential search on ordered list of given numbers.
26.	Maintain practical note book as per their serial numbers in library using Python dictionary.
27.	Perform following operations on dictionary 1) Insert 2) delete 3) change
28.	Check whether a number is in a given range using functions.
29.	Write a Python function that accepts a string and calculates number of upper case letters and lower case letters available in that string.
30.	To find the Max of three numbers using functions.
31.	Multiply all the numbers in a list using functions.
32.	Solve the Fibonacci sequence using recursion.
33.	Get the factorial of a non-negative integer using recursion.
34.	Write a program to create a module of factorial in Python.
35.	Design a Python class named <i>Rectangle</i> , constructed by a length & width, also design a method which will compute the area of a rectangle.
36.	Design a Python class named <i>Circle</i> constructed by a radius and two methods which will compute the area and the perimeter of a circle.
37.	Design a Python class to reverse a string 'word by word'.
38.	Write a Python program to read an entire <i>text file</i> .
39.	Design a Python program to read first n lines of a <i>text file</i> .
40.	Construct a Python program to write and append text to a file and display the text.

Text Books:

**I. K. Gujral Punjab Technical University Bachelor of
Science in Data Analytic (B Sc. Data Analytics)**

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.

Course Code: UGCA1918

Course Name: Data Structures Laboratory

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

Prerequisite: -NA-Co requisite: -NA-

Additional material required in ESE: - NA-

Course Outcomes: Student will be able to

CO#	Course outcomes
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	Program for using Dynamic Functions (malloc(), calloc(), realloc() and free()) functions.
2	Program to insert, delete and traverse an element from an array
3	Program to merge one dimensional arrays
4	Program for addition and subtraction of two matrices.
5	Program for implementing multiplication of two matrices
6	Implement linear search using one and two dimensional array.
7	Program for implementing selection sort.
8	Program for implementing insertion sort.
9	Program for implementing quick sort.

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10	Program for implementing merge sort.
11	Program to calculate length of the string using user defined function.
12	Program to concatenate and compare two strings using user defined function.
13	Program for using the concept of pointer to string.
14	Program to reverse a sentence by recursion.
15	Program to delete all repeated words in string.
16	Program to find the number of vowels, consonants, digits and white space in a string.
17	Program to find the length of the longest repeating sequence in a string.
18	Program to find highest and lowest frequency character in a string.
19	Program for implementing Stack using array.
20	Program for implementing Stack using pointer.
21	Program for implementing multiple stack.
22	Program for converting infix to postfix form.
23	Program for implementing Queue using array.
24	Program for dynamic implementation of queue.
25	Program for implementing circular queue.
26	Program for implementing dequeue.
27	Program for implementing priority queue.
28	Program for implementing Singly Linked list.
29	Program for implementing Doubly Linked list.
30	Program for implementing Binary Search Tree.
31	Program for Breadth First Search (BFS) for graph traversal.
32	Program for Depth First Search (DFS) for graph traversal.

Reference Books:

- Brijesh Bakariya. Data Structures and Algorithms Implementation through C, BPB Publications.
- Aho Alfred V., Hopperoft John E., Ullman Jeffrey D., “Data Structures and Algorithms”, Addison Wesley
- Horowitz & Sawhaney: Fundamentals of Data Structures, Galgotia Publishers.

Course Code: UGCA1937

Course Name: Data Warehouse and Mining Laboratory

Program: B. Sc. Data Analytics	L: 0 T: 0 P: 2
Branch: Computer Applications	Credits: 1
Semester: 3rd	Contact hours: 4 hours per week
Theory/Practical: Practical	Percentage of numerical/design problems: 90
Internal max. marks: 60	Duration of end semester exam (ESE): 3hrs
External max. marks: 40	Elective status: Elective

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Total marks: 100

Prerequisite: Basic understanding of database concepts.

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes: After going through this laboratory, student will be able to:

CO#	Course outcomes
CO1	Apply different data mining tools used to analyze data.
CO2	Apply and Evaluate different data mining algorithms to analyze data.
CO3	Understand effective visualization for representing data.

Instructions:

1	Introduction to WEK/ R tool.
2	Installation of Weka/ R Tool.
3	Introduction to various components of WEKA/ R tool.
4	Fundamental programming using WEKA/ R tool.
5	Implementing data preprocessing.
6	Implementing apriori algorithm.
7	Implementing classification using decision tree.
8	Implementing classification using decision tree induction.
9	Implementation k-mean clustering
10	Implementing different Data visualization tools.

- Number of practical's can be more than 10 by implementing these algorithmson different data sets. Also, visualization tools can be used simultaneously to represent the outcomes in a better way

Reference Books:

1. Data Mining: Practical Machine Learning Tools and Techniques, 3rd edition by Ian H. Witten, Eibe Frank, Mark A. Hall Published by Morgan Kaufmann.
2. Data analytics using R, 1st edition by Seema Acharya Published by Tata McgrawHill.

E Books/ Online learning material

Students can refer to youtube channel: Data Mining with Weka (WekaMOOC) by University of WAIKATO for reference using the following link: <https://www.youtube.com/user/WekaMOOC>
