SYLLABUS FOR THE BATCH FROM YEAR 2025 TO 2026

FOR

Certificate/Diploma in Data Analytics

(Credit Based Evaluation and Grading System)

SEMESTER: I-II

Programme Code:

EXAMINATIONS: 2025-2026

The Certificate/Diploma programme offered:

- Certificate Course in Data Analytics (6 months duration)
- Diploma in Data Analytics(1yearduration)

Program Outcomes:

- The students are able to understand the knowledge of data analytics and its real time implementation to meet their needs as well as IT industry requirements.
- Students will apply data analytics concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively.
- The students are able to expand knowledge of data computation and data structure approaches according to their desire outcomes.
- The students are able to comprehend data related responsibilities and acquire ability to make judgments by implementing data analytics concepts using professional software like Excel and Tableau.
- The students are able to handle the various responsibilities and handling data ethically, and understand the common social issues.

Department of Computational Statistics & Data Analytics

in collaboration with

Directorate of Open & Distance Learning

GURU NANAK DEV UNIVERSITY, AMRITSAR

Certificate Course/Diploma in Data Analytics (Semester System) Offered by Department of Computational Statistics & Data Analytics in Collaboration with Directorate of Open & Distance Learning and Online Studies, Guru Nanak Dev University Amritsar

Eligibility:

- +2 in any stream with at least 45% marks in aggregate(40%forSC/STcandidates).
- Any student doing Bachelor Degree, Master Degree, M.Phil., Ph.D. from GNDU.

SEMESTER–I

Sr.No.	Course Code	Course Title	L	T	P	Credits
1.	ODDA111T	**Introduction to Data Analytics**	4	0	0	4
2.	ODDA112T	**Fundamentals of Computers and Excel**	3	0	1	4
3.	ODDA113T	**Programming using Python**	3	0	1	4
4.	ODDA114P	**Minor Project-I**	0	0	4	4
		Total Credits:	10	0	6	16

SEMESTER–II

Sr.No.	Course Code	Course Title	L	T	P	Credits
1.	ODDA211T	**Data Structures**	4	0	0	4
2.	ODDA212T	**Data Visualization using Tableau**	3	0	1	4
3.	ODDA213T	**Ethics for Data Analytics**	4	0	0	4
4.	ODDA214P	**Minor Project-II**	0	0	4	4
		Total Credits:	11	0	5	16

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Diploma in Data Analytics for session 2025-2026

Subject Code: ODDA111T

Semester -I

Course Name	**Introduction to Data Analytics**
Course Code	
Credits (L-T-P)	**4 (4-0-0)**
Total Marks	**100**
Mid Semester Examination	**30% weightage**
End Semester Examination	**70% weightage**

Instructions for the Paper Setters: Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION - A

Overview of Data Analytics: Data Analytics Introduction, Definition, Data Analytics in various fields, Examples,Impact of Data Analytics, Data Analytics Life Cycle, Roles and Responsibilities of Data Analyst and Data Analytics Team.
Data Objects and Attribute Types: Nominal, Binary, Ordinal,Numeric, Discrete and Continuous, Types of data - Record, Temporal, SpatialTemporal, Graph, Unstructured and Semi structured data.

SECTION - B

Descriptive statistics: mean, median, mode, variance and standard deviation
Data Collection and Manipulation: Collectingand consuming data, Data sources, Data cleaning techniques (handling missing values, outliers), Data transformation and aggregation, communicating data insights.

SECTION - C

Difference between Data Science, Data Analytics and Data Engineering, Applications and fields of interests, Emerging Trends in Data Analytics, Ensuring the availability and accessibility of data for analysis.
Big Data and Data Science hype and getting past the hype, Why now? Datafication, Current landscape of perspectives, Skill sets needed.

SECTION – D

Data Analytics Methodologies: Descriptive Analytics, Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics.
Data Analytics Case Studies, Software Applications for Data Analytics, Resources for Open Data, Data Science Tools and Applications.

Course Outcomes:	
1	It will enable the students to understand the core concepts of the computer technology. Studentswill also be aware of the latest technology.
2	It gives idea about information technology and its various tools.
3	Students will get hands-on experience with MS Excel.

Suggested / Reference Books:	
1	Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly, 2014.
2	Mohammed J. Zakiand, Wagner, Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms, Cambridge University Press, 2014.

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Diploma in Data Analytics for session 2025-2026

Subject Code: ODDA112T (Semester –I)

Course Name	**Fundamentals of Computers and Excel**
Course Code	
Credits (L-T-P)	**4 (3-0-1)**
Total Marks	**100**
Mid Semester Examination	**30% weightage**
End Semester Examination	**70% weightage**

Instructions for the Paper Setters: Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION - A

Computer Basics: Introduction, Evolution of Computers, Computer Generations, Classification of Computers, Computer Applications.
Operating System Concepts: Role of an Operating System, Types of operating systems, Booting procedure and its types, Fundamentals and typical instructions of Windows & Non-Windows based Operating Systems.

SECTION - B

Input Devices: Keyboard, mouse, pens and touch screens, Microphone and Joystick
Output Devices: Monitor,Projector, Printers, plotters, Voice response units – Headphones and Speakers.
Memory and Storage: RAM, ROM, Storage devices – optical disk, HDD, SSD and Organization of Secondary Storage.

SECTION - C

MS Excel: Overview - creating, saving, opening, excel rows and columns, enter text and numbers in a cell, edit text in a cell, center text and numbers, Font Formatting excel, change the color of a cell, save your work in excel, currency symbols in excel, merge cells, using auto-fill, adding simple addition formula, The Sum Function, Copy and Paste, Using Paste Special, Multiply in excel, adding comment to a cell.

SECTION – D

MS Excel Charts: Sorting Data, Create an excel chart, Move and Resize your chart, Charts Styles and Layouts, Chart Titles and Series Titles, Format chart Panel, Creating and Editing Pie chart, Create a 2D line Chart in Excel, Format your Axis titles, Predict the future with a Trend line chart.
Basic Functions in Excel:SUM, AVG, COUNT, CountIF, CountIFS, SUMIF, SUMIFS and related Functions, Conditional Formatting in excel.

Course Outcomes:	
1	It will enable the students to understand the core concepts of the computer technology. Studentswill also be aware of the latest technology.
2	It gives idea about information technology and its various tools.
3	Students will get hands-on experience with MS Excel.

Suggested / Reference Books:	
1	P.K. Sinha, Computer Fundamentals, BPB Publications, 2011
2	Peter Norton, Introduction to Computers , Tata Mcgraw Hill (2017)
3	Excel with Microsoft Excel: Comprehensive & Easy Guide to Learn Advanced MS Excel (2019)
4	Balagurusamy E, Fundamentals of Computers, McGraw Hill Education; 1st edition (24 June 2009)

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Subject Code: ODDA113T

Semester -I

Course Name	**Programming using Python**
Course Code	
Credits (L-T-P)	**4 (3-0-1)**
Total Marks	**100**
Mid Semester Examination	**30% weightage**
End Semester Examination	**70% weightage**

Instructions for the Paper Setters: Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION –A

Algorithm and Flowchart: Introduction.
Python Basics:Introduction to Python and its Installation,keywords, Importance of indentation, comments, Data-types in Python, Variables in Python
Operators in Python: Assignment, Logical, Arithmetic etc.,
Input and Output statements

SECTION –B

Conditional Statements: If else and Nested If else and elif.
Collections: List, Tuple, Sets and Dictionary (with in-built methods)
Loops: For, While and Nested loops, loops with else, break and continue

SECTION –C

String Manipulation: Indexing, Slicing, etc., Functions and Methods, F-string.
User Defined Functions: Defining, Calling, Types of Functions &Arguments, pass

SECTION –D

File Management: open, close, read, write, append (on text files).
Text files: reading/writing text and numbers from/to a file; creating and reading aformatted file (csv or tab-separated)

Course Outcomes:	
1	Implement a given algorithm as a computer program in python language with the understandingof hardware components and memory utilization.
2	Able to use standard programming constructs: repetition, selection, functions, composition,modules and different data types
3	Adapt and combine standard algorithms to solve a given problem (includes numerical as wellas non-numerical algorithms) and to debug the program written in python language.

Suggested / Reference Books:	
1	Learning Python by Mark Lutz, 5th edition
2	Python Essential Reference, by David Beazley , 4th edition
3	Python cookbook, by David Beazley, 3rd Edition

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Diploma in Data Analytics for session 2025-2026

Subject Code: ODDA114P

Semester -I

Course Name	**Minor Project-I**
Course Code	
Credits (L-T-P)	**4 (0-0-4)**
Total Marks	**100**

Guidelines
A candidate should work on the Minor Project under the guidance of their guide

Examination		
Final Project Report	Final Project Report & Viva Voce	4 Credits

The evaluation shall be done as per the common ordinances for courses Credit Based Evaluation and Grading System.

Course Outcomes:
At the end of this course, the student should be able to understand the Design / Fabrication / Implementation work under the guidance of faculty member. The students have an exposure to work in a group and to understand the working of IT industry.

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Diploma in Data Analytics for session 2025-2026

Subject Code: ODDA211T (Semester –II)

Course Name	**Data Structures**
Course Code	
Credits (L-T-P)	**4 (4-0-0)**
Total Marks	**100**
Mid Semester Examination	**30% weightage**
End Semester Examination	**70% weightage**

Instructions for the Paper Setters: Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION - A

Introduction: About data structure, Data structureoperations,

Algorithm: Complexity, Time-space trade off, Algorithmic notations, Big O notation.

Arrays: Linear array, Representation of Linear array in memory, Traversing linear array, Inserting, Deleting, Sorting (Bubble sort), Searching (Linear search, Binary search).

SECTION - B

Stacks: Introduction, operations, Arithmetic expression, Polish notations, Transforming infix to postfix, Quick sort, Recursion concept, Tower of Hanoi.

Queues: Define Queues, Operations, Dequeues, PriorityQueues.

SECTION –C

String Processing: Introduction, Basic terminology, Storing strings, String operations, Word processing.

Linked List: Representation in memory, Traversing, Searching, Insertion, deletion, Header Linked List, Two ways List:operations.

SECTION –D

Trees: Binary trees, Representation in memory, Traversing, Traversal algorithms using stacks, Binary Search trees: Searching, Inserting and Deleting. Heap and Heap sort.

Graphs: Graph Theory Terminology, Sequential Representation, Warshall's Algorithm, Linked Representation, Traversing a graph, Hashing.

Course Outcomes:	
1	Comprehend concepts related to write algorithms/pseudo code.
2	Design programs involving decision control statements, loop control statements, case control structures, arrays, strings, stacks, queues using array and linked list, tree structure implementation using pointers, use of dynamics memory allocation.
3	Comprehend the concepts of linear and Non-Linear data structures

Suggested / Reference Books:	
1	Seymour Lipschutz: Theory and Problems of Data Structures, Schaum's Outline Series
2	Aho A. V. J. E. Hopcroft, J.D. Ullman; Data Structures and Algorithms,Addison–Wesley, 1983.
3	Baase, S Computer Algorithms; Introduction to Design and Analysis, Addison–Wesley, 1978

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Diploma in Data Analytics for session 2025-2026

Subject Code: ODDA212T (Semester –II)

Course Name	**Data Visualization using Tableau**
Course Code	
Credits (L-T-P)	**4 (3-0-1)**
Total Marks	**100**
Mid Semester Examination	**30% weightage**
End Semester Examination	**70% weightage**

Instructions for the Paper Setters: Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION - A

Overview and Introduction: Tableau Vs. Excel
Tableau Environment: Registration, Installation for Students, Installation Troubleshooting and useful links
Tableau Basics: Learning the Tableau Environment, Loading your Data, Keep Only and Exclude Methods, CSV Export

SECTION –B

Introduction to Charts and Plots: Columns and Bar Charts, Line and Area Charts - View Data, Quick Switch, Pie Charts, Labels, Quick Build
Formatting Charts: Bar Charts - Color Scales, Color Choice, Create Sheets, Sizing, Lines - Color Palettes,Sizing, Label Variations, Tooltip, Area Chart Formatting (Similar to Lines Formatting), Pie Chart - Formatting Similar to Lines and Area Charts)

SECTION –C

Quick Table Calculations: Running Total, Moving Average, Filtering, MultipleMeasures, Logic (Boolean) and Numerical Formulas, Calculation Assistant
Dashboard Development: Layout, Dashboard Sizing, Titles, Formatting

SECTION –D

Tableau Public and Desktop: Copy, Export, Print to PDF, Print, Print Screen
Additional Visualizations: Histograms, Funnel Graphs, Gantt Charts, Donut Charts,Packed Bubbles, Waterfall Chart, etc.
Data Preparation and **ETL** (Extract, Transform, Load) Tool

Course Outcomes:	
1	Develop insights of how Tableau is better than Excel
2	Understand Data Analytics/Visualizations using Tableau
3	Use Tableau for Data Visualizations

Suggested / Reference Books:	
1	Ann Jackson, Luke Stanke, “Tableau Strategies: Solving Real, Practical Problems with Data Analytics” by O'Reilly, 2021
2	Murray, Daniel G., “Tableau your data!: fast and easy visual analysis with Tableau Software” by Wiley, 2016
3	Molly Monsey, Paul Sochan, “Tableau for Dummies” by Wiley, 2015

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Diploma in Data Analytics for session 2025-2026

Subject Code: ODDA213T (Semester –II)

Course Name	**Ethics for Data Analytics**
Course Code	
Credits (L-T-P)	**4 (4-0-0)**
Total Marks	**100**
Mid Semester Examination	**30% weightage**
End Semester Examination	**70% weightage**

Instructions for the Paper Setters: Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION–A

Data, Individuals, and Society: Power and impact of analytics and AI/ML on individuals and society, fairness and bias, ethics, legality, data collection and public use.

SECTION –B

The foundation of Big Data: Various components of big data, statistical techniques to data scenarios, issues in learning from big data, ranging from data biases, overfitting, causation vs correlation.

SECTION –C

Fairness in AI/ML: Basic AI/ML techniques for data handling, identification of fairness and bias, issues in the design of decision-making systems, Fairness and bias in the social and legal context of facial recognition, naturallanguage processing, and predictive algorithms,

SECTION –D

Bias Mitigation and Future Opportunities: Quantify of bias, various methods of algorithmic fairness to mitigate this bias, uses of analytics to transform a current biased data-set into a more objective solution.

Course Outcomes:	
1	To understand the power and impact that analytics and AI/ML have on individuals and society.
2	To understand the underlying components of big data
3	To understand and apply basic AI/ML techniques to data scenarios, with a focus on identifying fairness and bias issues.

Suggested / Reference Books:	
1	Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy by Cathy O'Neil (2016)
2	AI ethics by mark Coeckelbergh, MIT Press, 2020.
3	S.Matthew Liao, Ethics of Artificial Intelligence, Oxford University Press, 2020

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Diploma in Data Analytics for session 2025-2026

Subject Code: ODDA214P (Semester –II)

Course Name	**Minor Project-II**
Course Code	
Credits (L-T-P)	**4 (0-0-4)**
Total Marks	**100**

Guidelines
A candidate should work on the Minor Project under the guidance of their guide

Examination		
Final Project Report	Final Project Report & Viva Voce	4 Credits

The evaluation shall be done as per the common ordinances for courses Credit Based Evaluation and Grading System.

Course Outcomes:
At the end of this course, the student should be able to understand the Design / Fabrication / Implementation work under the guidance of faculty member. The students have an exposure to work in a group and to understand the working of IT industry.