

PUNJABI UNIVERSITY, PATIALA

**ORDINANCES
AND OUTLINES OF TESTS
SYLLABI AND COURSES OF READING**

FOR

CERTIFICATE COURSE IN

- 1. Programming with Python (PPY)**
- 2. Data Analysis with Python (DAP)**
- 3. Data Science with R (DSR)**

(Three Months)

Session 2018-19, 2019-20 and 2020-21 EXAMINATIONS

**PUNJABI UNIVERSITY
PATIALA – 147 002**

ORDINANCES FOR CERTIFICATE COURSE IN COMPUTER APPLICATIONS (C.C.A.) COURSE EXAMINATION. APPLICABILITY OF ORDINANCES FOR THE TIME BEING IN FORCE

These Certificate Courses will be of three months duration. The Ordinances in force at the time a student joins a course shall hold good only for the examination held during or at the end of the course. Nothing in these ordinances shall be deemed to debar the University from amending the ordinances subsequently and the amended ordinances, if any, shall apply to all the students whether old or new.

1. Structure and Duration of the Programme:

- The course for the PPY, DAP and DSR shall be of three months.
- The University or a College may conduct Certificate Course in four times in a year with the following sequence:
 - a) April to June
 - b) July to September* (starting 2018)
 - c) October to December
 - d) January to March*(starting 2019)

2. Eligibility for Admission.

The examination shall be open to any person who has passed Bachelor Degree in Computer Science / Application / Computer Engineering and Information Technology or any other examination recognized as equivalent thereto.

3. The outlines of tests and syllabi shall be such as prescribed by the Academic Council from time to time.
4. The College/Centre will charge a fixed amount of fees as prescribed by the University at the time of admission of a student. The College/Centre will pay to the University all charges including annual charges. There is no examination fee as the whole examination will be conducted by the respective College/Centre.
5. The course will be considered as a minor course.
6. The medium of instructions shall be English and the medium of examination shall be English.
 - a) The minimum number of marks required to pass the examination shall be 35% in each paper.
7.
 - a) A candidate who fails in one papers in a course may be declared 're-appear' in these paper and may be permitted to `re-appear' in those papers at a subsequent examination within two chances.
 - b) If a candidate fails in more than one paper, he/she will be declared `fail'.
8. The grace marks shall be allowed according to the ordinance relating to "Award of grace Marks" as per University rules.
9. The final examination shall be open to a student
 - a. Who has passed the Bachelor Degree examination of any University or equivalent examination?
 - b. Satisfies the following requirements:
 - i) Who has been on the rolls of the college/centre throughout the course preceding the examination?
 - ii) Every candidate will be required to attend 75% attendance of the delivered lectures in each paper.

Teaching/Seminars/Tutorial/Guided Library Reading Period of 1 hour's duration	-1 attendance
Practical one period-may be of 2 Hour's duration	-1 attendance

- iii) In case of students, whose names are struck off on account of non-payment of fee, their periods, for the time they were not on the rolls, shall not be accounted for.
- iv) The shortage in the attendance of lectures by the candidate will be condoned as per rules made by the University from time to time.

10. Award of Division and Distinction:

Successful candidates who obtain 60% or more of the aggregate number of marks in the examinations, shall be placed in the first division; those who obtain 50% marks or more but less than 60% shall be placed in the second division and all below 50% marks shall be placed in the third division. Successful candidates who obtain 75% or more marks in aggregate shall be placed in the First Division with 'Distinction'.

- 11.** Certificate will be issued by University after Colleges/Centers send the awards to the University.

**Certificate Course in:
Programming with Python (PPY)**

Session 2018-19, 2019-20 and 2020-21 EXAMINATIONS

Total Marks: 200 (Theory: 100, Practical: 100)

Paper	Title	University Examination	Internal Assessment	Weekly Workload	Exam. Duration
CPP-101	Programming with Python	80	20	5 Hours	3 Hours
CPP-102	Software Lab - (Programming with Python)	60	40	10 Hours	3 Hours

CPP-101: Programming with Python

Max Marks : 80
Min Pass Marks: 35%

Lectures to be delivered: 40
Time Allowed: 3 Hours

(A) Instructions for the Paper setter:

The question paper will consist of three sections: A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and carrying 16 marks for each question. Section C will consist of 5-10 short answer type questions, which will cover the entire syllabus uniformly and will carry 16 marks in all.

(B) Instructions for the Candidates:

Candidates are required to attempt two questions each from the section A and B of the question paper and the entire section C.

SECTION-A

Introduction to Python: Python Installation and Working with Python Understanding Python variables Python basic Operators Understanding python blocks.

Data Types: Declaring and using Numeric data types: int, float, complex Using string data type and string operations Defining list and list slicing, Use of Tuple data type.

Program Flow Control: Conditional blocks using if, else and elif Simple for loops in python For loop using ranges, string, list and dictionaries Use of while loops in python Loop manipulation using pass, continue, break and else Programming using Python conditional and loops block.

Functions Modules and Packages: Organizing python codes using functions Organizing python projects into modules Importing own module as well as external modules Understanding Packages Powerful Lamda function in python Programming using functions, modules and external packages.

SECTION-B

String List and Dictionary Manipulations: Building blocks of python programs Understanding string in build methods List manipulation using in build methods Dictionary manipulation Programming using string, list and dictionary in build functions.

File Operation: Reading config files in python Writing log files in python Understanding read functions, read(), readline() and readlines() Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming using file operations.

Recommended Books:

Downey, Allen B. (May 2012). Think Python: How to Think Like a Computer Scientist (Version 1.6.6 ed.). ISBN 978-0-521-72596-5.

Hamilton, Naomi (5 August 2008). "The A-Z of Programming Languages: Python". Computerworld. Archived from the original on 29 December 2008. Retrieved 31 March 2010.

Lutz, Mark (2013). Learning Python (5th ed.). O'Reilly Media. ISBN 978-0-596-15806-4.

Pilgrim, Mark (2004). Dive Into Python. Apress. ISBN 978-1-59059-356-1.

Pilgrim, Mark (2009). Dive Into Python 3. Apress. ISBN 978-1-4302-2415-0.

Summerfield, Mark (2009). Programming in Python 3 (2nd ed.). Addison-Wesley Professional. ISBN 978-0-321-68056-3.

CPP-102: SOFTWARE LAB – (Programming with Python)

Max Marks: 60

Min Pass Marks: 35%

Lectures to be delivered: 40

Time Allowed: 3 Hours

1. To Calculate the Average of Numbers in a Given List
2. To Exchange the Values of Two Numbers Without Using a Temporary Variable
3. To Check if a Number is a Palindrome
4. To Print all Integers that Aren't Divisible by Either 2 or 3 and Lie between 1 and 50.
5. To Compute Prime Factors of an Integer
6. To Generate all the Divisors of an Integer
7. To Print Table of a Given Number
8. To Print Sum of Negative Numbers, Positive Even Numbers and Positive Odd numbers in a List
9. To Print Numbers in a Range (1,upper) Without Using any Loops
10. To Find the Sum of Sine Series
11. To Find the Sum of Cosine Series
12. To Find the Sum of First N Natural Numbers
13. To Search the Number of Times a Particular Number Occurs in a List
14. To Find the Largest Number in a List
15. To Find the Second Largest Number in a List
16. To Sort the List According To the Second Element in Sublist
17. To Find the Second Largest Number in a List Using Bubble Sort
18. To Sort a List According To the Length of the Elements
19. To Create a List of Tuples with the First Element as the Number and Second Element as the Square of the Number
20. To Find all Numbers in a Range which are Perfect Squares and Sum of all Digits in the Number is Less than 10
21. To Sort a List of Tuples in Increasing Order by the Last Element in Each Tuple
22. To Swap the First and Last Value of a List
23. To Remove the ith Occurrence of the Given Word in a List where Words can Repeat
24. To Replace all Occurrences of 'a' with \$ in a String
25. To Remove the nth Index Character from a Non-Empty String
26. To Detect if Two Strings are Anagrams
27. To Form a New String where the First Character and the Last Character have been Exchanged
28. To Count the Number of Vowels in a String
29. To Take in a String and Replace Every Blank Space with Hyphen
30. To Add a Key-Value Pair To the Dictionary
31. To Concatenate Two Dictionaries InTo One
32. To Form a Dictionary from an Object of a Class
33. To Map Two Lists inTo a Dictionary
34. To Count the Frequency of Words Appearing in a String Using a Dictionary
35. To Find the Factorial of a Number Using Recursion
36. To Find the Sum of Elements in a List Recursively
37. To Read the Contents of a File
38. To Count the Number of Words in a Text File
39. To Copy the Contents of One File inTo Another
40. To Read a Text File and Print all the Numbers Present in the Text File
41. To Append the Contents of One File To Another File
42. To Count the Number of Blank Spaces in a Text File
43. To Read a File and Capitalize the First Letter of Every Word in the File
44. To Read the Contents of a File in Reverse Order

**Certificate Course in:
Data Analysis with Python (DAP)**

Session 2018-19, 2019-20 and 2020-21 EXAMINATIONS

Total Marks: 200 (Theory: 100, Practical: 100)

Paper	Title	University Examination	Internal Assessment	Weekly Workload	Exam. Duration
DAP-101	Data Analysis with Python	80	20	5 Hours	3 Hours
DAP-102	Software Lab – (Data Analysis with Python)	60	40	10 Hours	3 Hours

DAP-101: Data Analysis with Python

Max Marks : 80
Min Pass Marks: 35%

Lectures to be delivered: 40
Time Allowed: 3 Hours

(A) Instructions for the Paper setter:

The question paper will consist of three sections: A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and carrying 16 marks for each question. Section C will consist of 5-10 short answer type questions, which will cover the entire syllabus uniformly and will carry 16 marks in all.

(B) Instructions for the Candidates:

Candidates are required to attempt two questions each from the section A and B of the question paper and the entire section C.

SECTION-A

Introduction to Data Science: Common Python functionality and features for data scientists use, Common functionality and features of Jupyter Notebook.

Data Cleaning and Processing using python toolkit, Loading, saving files using pandas. How to read data into Data Frame structures, how to query these structures. Understanding of the python Pandas library, Merge Data Frames, Generate summary tables, Group data into logical pieces and manipulate dates. Understanding of scales of data, issues with creating metrics for analysis.

SECTION-B

Introduction to a variety of statistical techniques viz distributions, sampling and t-tests. Working on project starting with data cleaning activity and developing hypothesis. Testing knowledge of cleaning, merging, manipulating, and testing for significance of data.

Recommended Books:

Downey, Allen B. (May 2012). Think Python: How to Think Like a Computer Scientist (Version 1.6.6 ed.). ISBN 978-0-521-72596-5.

Hamilton, Naomi (5 August 2008). "The A-Z of Programming Languages: Python". Computerworld. Archived from the original on 29 December 2008. Retrieved 31 March 2010.

Lutz, Mark (2013). Learning Python (5th ed.). O'Reilly Media. ISBN 978-0-596-15806-4.

Pilgrim, Mark (2004). Dive Into Python. Apress. ISBN 978-1-59059-356-1.

Pilgrim, Mark (2009). Dive Into Python 3. Apress. ISBN 978-1-4302-2415-0.

Summerfield, Mark (2009). Programming in Python 3 (2nd ed.). Addison-Wesley Professional. ISBN 978-0-321-68056-3.

DAP-102: SOFTWARE LAB – (Data Analysis with Python)

Max Marks: 60

Min Pass Marks: 35%

Lectures to be delivered: 40

Time Allowed: 3 Hours

1. Program to find descriptive analysis of data
2. To find standard deviation
3. To find measures of central tendency.
4. To find measures of dispersion.
5. To create a histogram showing the frequency.
6. To create box-plots find outliers
7. To create factor, arrays, matrices, lists, Data frame exercises
8. To import read delimited data.
9. To explore data with tables, complex tables
10. To aggregates, sub-setting, shaping, transformation, chi-square tests exercises.
11. To plot various visualizations of data
12. To apply independent t-Test, paired, one-way Anova, Two way Anova.
13. To do clustering and classification exercises

Certificate Course in:
Data Science with R (DSR)

Session 2018-19, 2019-20 and 2020-21 EXAMINATIONS

Total Marks: 200 (Theory: 100, Practical: 100)

Paper	Title	University Examination	Internal Assessment	Weekly Workload	Exam. Duration
DSR-101	Data Science with R	80	20	5 Hours	3 Hours
DSR-102	Software Lab -(Data Science with R)	60	40	10 Hours	3 Hours

DSR-101: Data Science with R

Max Marks : 80
Min Pass Marks: 35%

Lectures to be delivered: 40
Time Allowed: 3 Hours

(A) Instructions for the Paper setter:

The question paper will consist of three sections: A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and carrying 16 marks for each question. Section C will consist of 5-10 short answer type questions, which will cover the entire syllabus uniformly and will carry 16 marks in all.

(B) Instructions for the Candidates:

Candidates are required to attempt two questions each from the section A and B of the question paper and the entire section C.

SECTION-A

Introduction to Business Analytics, Types of Analytics, Data Science and its importance, Introduction to R, Installing R, Installing R Studio, R Packages, R Programming, if, for, while, repeat, break, next, switch, scan statements, Executing the commands in a File, Data Structure, Vector, Matrix, Array, Data frame, List, Factors, Functions, DPLYR & apply Function, Import Data File, DPLYR, Selection, Filter, Arrange, Mutate, Data Visualization in R, Bar chart, Dot plot, Scatter plot, Pie chart, Histogram and Box plot, Heat Maps.

SECTION-B

Introduction to Statistics, Distance Measures, Euclidean space, Manhattan, Minkowski, Cosine similarity Mahalanobis distance, Pearson's correlation coefficient, Probability Distributions, Hypothesis Testing, T Test, Anova, Testing about population, Chi Square Test, F distribution and F ratio, Regression Analysis, Linear, Non-linear Regression Models, Classification, Decision Tree, Logistic Regression, Bayesian, Support Vector Machines, Clustering, K-means Clustering, DBSCAN Clustering, Hierarchical Clustering, Association, Apriori Algorithm, Candidate Generation, Visualization on Associated Rules.

Recommended Books:

Thomas Rahlf. Data Visualisation with R. Springer International Publishing, New York, 2017. ISBN 978-3-319-49750-1.

Matthias Kohl. Introduction to statistical data analysis with R. bookboon.com, London, 2015. ISBN 978-87-403-1123-5.

Marta Blangiardo and Michela Cameletti. Spatial and Spatio-temporal Bayesian Models with R-INLA. Wiley, Chichester, West Sussex, United Kingdom, 1st edition, 2015. ISBN 978-1-118-32655-8.

Gergely Daróczi. Mastering Data Analysis with R. Packt Publishing, 9 2015. ISBN 9781783982028.

Victor A. Bloomfield. Using R for Numerical Analysis in Science and Engineering. Chapman & Hall/CRC, 2014. ISBN 978-1439884485.

DSR-102: SOFTWARE LAB – (Data Science with R)

Max Marks: 60

Min Pass Marks: 35%

Lectures to be delivered: 40

Time Allowed: 3 Hours

1. Program to find descriptive analysis of data
2. To find standard deviation
3. To find measures of central tendency.
4. To find measures of dispersion.
5. To create a histogram showing the frequency.
6. To create box-plots find outliers
7. To create factor, arrays, matrices, lists, data-frame exercises
8. To import read delimited data.
9. To explore data with tables, complex tables
10. To aggregates, sub-setting, shaping, transformation, chi-square tests exercises.
11. To plot various visualizations of data
12. To apply independent t-Test, paired, one-way Anova, Two way Anova.
13. To do clustering and classification exercises