# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## DEPARTMENT OF COMPUTER SCIENCE

## Course Structure for Data Science

**Programme:** B.Sc. with Data Science as one of the Core Subjects.
**Discipline:** Computer Science

| Year | Semester | Course Code | Course Name | Hours per week | Credits | IA | ES | Total |
|---|---|---|---|---|---|---|---|---|
| I | II | DCSC N-2352 | Introduction to Data Science using R | 4 | 3 | 40 | 60 | 100 |
| | | DCSC N-2352P | Introduction to Data Science using R Lab | 2 | 1 | 25 | 25 | 50 |
| II | III | | Big Data Technology | 4 | 3 | 40 | 60 | 100 |
| | | | Big Data Technology using Hadoop Lab | 2 | 1 | 25 | 25 | 50 |
| | IV | | Data Mining and Data Analysis | 4 | 3 | 40 | 60 | 100 |
| | | | Data Mining and Data Analysis Lab | 2 | 1 | 25 | 25 | 50 |
| | | | Big Data Acquisition and Analysis | 4 | 3 | 40 | 60 | 100 |
| | | | Big Data Acquisition and Analysis Lab | 2 | 1 | 25 | 25 | 50 |

# SRR&CVR GOVT DEGREE COLLEGE (A)::VIJAYAWADA

## I BSc (Data Science)

## Revised Syllabus 2021-22

| Semester | Course Code | Course Title | Hours | Credits |
|---|---|---|---|---|
| II | DCSC N-2352 | INTRODUCTION TO DATA SCIENCE WITH R | 60 | 3 |

**Objective**

Data Science is a fast-growing interdisciplinary field, focusing on the analysis of data to extract knowledge and insight. This course will introduce students to the collection. Preparation, analysis, modeling and visualization of data, covering both conceptual and practical issues. Examples and case studies from diverse fields will be presented, and hands-on use of statistical and data manipulation software will be included.

***Outcomes***

1. Recognize various disciplines that contribute to a successful data science effort.
2. Understand the processes of data science - identifying the problem to be solved, data collection, preparation, modeling, evaluation and visualization.
3. Be aware of the challenges that arise in data sciences.
4. Develop and appreciate various techniques for data modeling and mining.
5. Be cognizant of ethical issues in many data science tasks.
6. Be comfortable using commercial and open source tools such as the R language and its associated libraries for data analytics and visualization.
7. Learn skills to analyze real time problems using R
8. Able to use basic R data structures in loading, cleaning the data and preprocessing the data.
9. Able to do the exploratory data analysis on real time datasets
10. Able to understand and implement Linear Regression
11. Able to understand and use - lists, vectors, matrices, dataframes, etc.

**Unit-1:**

Introduction to Data Science- Introduction- Definition - Data Science in various fields - Examples - Impact of Data Science - Data Analytics Life Cycle - Data Science Toolkit - Data Scientist - Data Science Team

Understanding data: Introduction – Types of Data: Numeric – Categorical – Graphical – High Dimensional Data – Classification of digital Data: Structured, Semi-Structured and Un-Structured - Example Applications. Sources of Data: Time Series – Transactional Data – Biological Data – Spatial Data – Social Network Data – Data Evolution.

**Unit-2:**

Introduction to R- Features of R - Environment - R Studio. Basics of R-Assignment - Modes - Operators - special numbers - Logical values - Basic Functions - R help functions - R Data Structures - Control Structures. Vectors: Definition- Declaration - Generating - Indexing - Naming - Adding & Removing elements - Operations on Vectors - Recycling - Special Operators - Vectorized if- then else-Vector Equality – Functions for vectors - Missing values - NULL values - Filtering & Subsetting.

**Unit-3:**

Matrices - Creating Matrices - Adding or Removing rows/columns - Reshaping - Operations - Special functions on Matrices. Lists - Creating List – General List Operations - Special Functions - Recursive Lists. Data Frames - Creating Data Frames - Naming - Accessing - Adding - Removing - Applying Special functions to Data Frames - Merging Data Frames- Factors and Tables.

**Unit- 4:**

Input / Output – Reading and Writing datasets in various formats - Functions - Creating User-defined functions - Functions on Function Object - Scope of Variables - Accessing Global, Environment - Closures - Recursion. Exploratory Data Analysis - Data Preprocessing - Descriptive Statistics - Central Tendency - Variability - Mean - Median - Range - Variance - Summary - Handling Missing values and Outliers - Normalization

Data Visualization in R : Types of visualizations - packages for visualizations - Basic Visualizations, Advanced Visualizations and Creating 3D plots.

**Unit- 5:**

Inferential Statistics with R - Types of Learning - Linear Regression- Simple Linear Regression - Implementation in R - functions on lm() - predict() - plotting and fitting regression line. Multiple Linear Regression - Introduction -comparison with simple linear regression - Correlation Matrix - F-Statistic - Target variables Vs Predictors - Identification of significant features - Implementation of Multiple Linear Regression in R.

**References**

1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014.
2. Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.
3. Mark Gardener, “Beginning R - The Statistical Programming Language”, John Wiley & Sons, Inc., 2012.
4. W. N. Venables, D. M. Smith and the R Core Team, “An Introduction to R”, 2013.

## SRR&CVR GOVT DEGREE(A) COLLEGE VIJAYAWADA

## B.Sc(Data Science) I Year Semester –II 2020-21

## BluePrint for INTRODUCTION TO DATA SCIENCE WITH R

| Section | | Unit-1 | Unit-2 | Unit-3 | Unit-4 | Unit-5 | Total questions | No of questions answered | Marks alloted |
|---|---|---|---|---|---|---|---|---|---|
| Section-A | Short Answer Questions | 2 | 2 | 2 | 2 | 2 | 10 | 5 | 5X 4=20 |
| Section-B | Essay Questions | 2 | 2 | 2 | 2 | 2 | 10 | 5 | 5X8=40 |

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## I BSc (Data Science) Semester -II

## Revised Syllabus 2021-22

## INTRODUCTION TO DATA SCIENCE WITH R

### MODEL PAPER

**Time: 3hrs** **Max Marks:60**

### SECTION-A

**Answer Any FIVE of the following Questions** **5 X 4= 20 marks**

1.Define data science and applications of data science?

2.write short notes on data collection ?

3.Write about data attributes ?

4.Write about Help functions in R?

5.Briefly explain about R studio ?

6.How to declare Vector and Scalars in R?

7. Explain procedure to add and delete rows and columns in matrix ?

8.Explain difference between a Vector and Matrix in R?

9. Write short notes on recursive lists R?

10.Explain about merging of Data Frames in R?

### SECTION – B

**Answer All the following questions** **5 X 8=40M.**

11 a) Explain about different types of Databases in data Science?

OR

b)Explain about Data collection methods?

12.a) Explain about Data Cleaning methods ?

OR

b) Explain about Data Characterisation and Analysis ?

13.a)Explain about data structures in R language ?

OR

b)Explain about Data Modelling and Mining techniques in R ?

14.a). What is Vector and explain about common vector operations ?

OR

b) Explain about various functions applied on matrix rows and columns?

15. a) What is List? Explain about various operations on Lists?

OR

b) What is Data Frame ? Explain procedure to create Data Frame with example?

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## I BSc (Data Science) Semester -II

## Revised Syllabus 2021-22

**INTRODUCTION TO DATA SCIENCE WITH R**

## Question Bank

### SECTION-A

**SHORT ANSWER QUESTIONS - 4 MARKS**

1.Define data science and applications of data science?
2.write short notes on data collection ?
3.Write about data attributes ?
4.Write about Help functions in R?
5.Briefly explain about R studio ?
6.How to declare Vector and Scalars in R?
7. Explain procedure to add and delete rows and columns in matrix ?
8.Write short notes on Filtering ?
9.Explain difference between a Vector and Matrix in R?
10. Write short notes on recursive lists R?
11.Explain about merging of Data Frames in R?
12.Explain about Recursive Lists?

**LONG ANSWER QUESTIONS 8 MARKS**

1. Explain about different types of Databases in data Science?
2. Explain about Data collection methods?
3. Explain about Data Cleaning methods ?
4. Explain about Data Characterisation and Analysis ?
5.Explain about data structures in R language ?

6.Explain about Data Modelling and Mining techniques in R ?
7.What is Vector and explain about common vector operations ?

8. Explain about various functions applied on matrix rows and columns?

9. What is List? Explain about various operations on Lists?
10. What is Data Frame ? Explain procedure to create Data Frame with example?

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## I BSc (Data Science)

## Revised Syllabus 2021-22

| Semester | Course Code | Course Title | Hours | Credits |
|---|---|---|---|---|
| II | DCSC N-2352P | **R Programming LAB** | 30 | 2 |

## LIST OF EXPERIMENTS

1) Installing R and R studio
2) Create a folder DS_R and make it a working directory. Display the current working directory
3) installing the "ggplot2", "caTools", "CART" packages
4) load the packages "ggplot2", "caTools".
5) Basic operations in r
6) Working with Vectors:
   - Create a vector v1 with elements 1 to 20.
   - Add 2 to every element of the vector v1.
   - Divide every element in v1 by 5
   - Create a vector v2 with elements from 21 to 30. Now add v1 to v2.
7) Getting data into R, Basic data manipulation
8) Using the data present in the table given below, create a Matrix "**M**"

|  | *C1* | *C2* | *C3* | *C4* | *C5* |
|---|---|---|---|---|---|
| *C1* | *0* | *12* | *13* | *8* | *20* |
| *C2* | *12* | *0* | *15* | *28* | *88* |
| *C3* | *13* | *15* | *0* | *6* | *9* |
| *C4* | *8* | *28* | *6* | *0* | *33* |
| *C5* | *20* | *88* | *9* | *33* | *0* |

Find the pairs of cities with shortest distance.

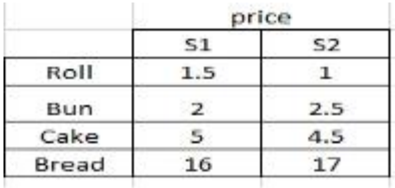
9) Consider the following marks scored by the 6 students

| Section | Student no | M1 | M2 | M3 |
|---|---|---|---|---|
| A | 1 | 45 | 54 | 45 |
| A | 2 | 34 | 55 | 55 |

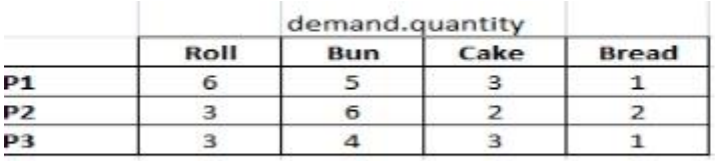
| | | | | |
|---|---|---|---|---|
| A | 3 | 56 | 66 | 64 |
| B | 1 | 43 | 44 | 45 |
| B | 2 | 67 | 76 | 78 |
| B | 3 | 76 | 68 | 37 |

- create a data structure for the above data and store in proper positions with proper names
- display the marks and totals for all students
- Display the highest total marks in each section.
- Add a new subject and fill it with marks for 2 sections.

- Three people denoted by P1, P2, P3 intend to buy some rolls, buns, cakes and bread. Each of them needs these commodities in differing amounts and can buy them in two shops S1, S2. The individual prices and desired quantities of the commodities are given in the following table "demand.



| | price | |
|---|---|---|
| | S1 | S2 |
| Roll | 1.5 | 1 |
| Bun | 2 | 2.5 |
| Cake | 5 | 4.5 |
| Bread | 16 | 17 |

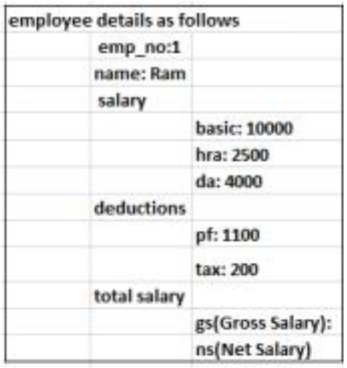


| | demand.quantity | | | |
|---|---|---|---|---|
| | Roll | Bun | Cake | Bread |
| P1 | 6 | 5 | 3 | 1 |
| P2 | 3 | 6 | 2 | 2 |
| P3 | 3 | 4 | 3 | 1 |

Create matrices for above information with row names and col names.

- Display the demand.quantity and price matrices
- Find the total amount to be spent by each person for their requirements in each shop
- Suggest a shop for each person to buy the products which is minimal.

10) Consider the following employee details:



| | | |
|---|---|---|
| employee details as follows | | |
| | emp_no:1 | |
| | name: Ram | |
| | salary | |
| | | basic: 10000 |
| | | hra: 2500 |
| | | da: 4000 |
| | deductions | |
| | | pf: 1100 |
| | | tax: 200 |
| | total salary | |
| | | gs(Gross Salary): |
| | | ns(Net Salary) |

- Create a list for the employee data and fill gross and net salary.
- Add the address to the above list
- display the employee name and address
- remove street from address
- remove address from the List.

11) Loops and functions - Find the factorial of a given number
12) Implementation of Data Frame and its corresponding operators and functions
13) Implementation of Reading data from the files and writing output back to the specified file
14) Treatment of NAs, outliers, Scaling the data, etc
15) Applying summary() to find the mean, median, standard deviation, etc
16) Implementation of Visualizations - Bar, Histogram, Box, Line, scatter plot, etc.
17) Implementation of Linear and multiple Linear Regression
18) Fitting regression line

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## II BSc (Data Science)

## Revised Syllabus 2021-22

| Semester | Course Code | Course Title | Hours | Credits |
|---|---|---|---|---|
| III | | BIG DATA TECHNOLOGY | 60 | 3 |

**Objectives:**

This course provides practical foundation level training that enables immediate and effective participation in big data projects. The course provides grounding in basic and advanced methods to big data technology and tools, including MapReduce and Hadoop and its ecosystem.

Outcome

1. Learn tips and tricks for Big Data use cases and solutions.
2. Acquire knowledge of HDFS components , Namenode, Datanode, etc.
3. Acquire knowledge of storing and maintaining data in cluster, reading data from and writing data to Hadoop cluster.
4. Able to maintain files in HDFS
5. Able to write MapReduce applications to access data present on HDFS
6. Able to read different formats of files into map-reduce application.
7. Able to develop MapReduce applications to analyze Big Data related to the real world use cases.
8. Able to write MapReduce applications that can take data from multiple datasets and join them
9. Able to optimize the performance of Map-Reduce application

### Unit-I: Introduction to Big Data

Introduction –Distributed File System – Big Data and its importance, Characteristics of Big Data, Limitation of Conventional Data Processing Approaches, Need of big data frameworks, Big data analytics, Limitations of Big Data and Challenges, Big data applications

### Unit-II

**Hadoop**: Basic Concepts of Hadoop and its features -The Hadoop Distributed File System (HDFS)- Anatomy of a Hadoop Cluster - Hadoop cluster modes - Hadoop Architecture, Hadoop Storage - Hadoop daemons (Name node-Secondary name node-Job tracker-Task tracker-Data node,etc) - Anatomy of Read & Write operations – Interacting HDFS using command-line (HDFS Shell and FS shell commands) -Interacting HDFS using Java APIs – Dataflow – Blocks –Replica - YARN.

## Unit-III

**Hadoop Ecosystem Components** – Schedulers- Fair and Capacity, Hadoop 2.0 Vs Hadoop 3.0 and its new features.

**Hadoop Cluster Setup** – SSH & Hadoop Configuration –HDFS Administering – Monitoring & Maintenance.

## Unit-IV

Hadoop MapReduce - **Introduction - Phases in MapReduce Framework - Anatomy of MapReduce Job run - Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features. Understanding Basic MapReduce Pogram (WordCount program): The Driver Code - The Mapper class - The Reducer class.**

## Unit-V:

**Writing first MapReduce Program - Hadoop's Streaming API - Using Eclipse for Rapid Development – YARN Vs MapReduce Advanced MapReduce Concepts: Partitioner – Combiner – Joins – Map-side Join – Reduce-side Join - Case Study: Weblog Analysis done using Mapper, Reducer, Combiner, Partitioner, etc.**

## References

1. Boris lublinsky, Kevin t. Smith Alexey Yakubovich, "Professional Hadoop Solutions".

   Wiley, ISBN : 9788126551071, 2015.

2. Chris Eaton, Dirk Deroos et al., "Understanding Big Data", McGraw Hill , 2010.
3. Tom White, "HADOOP" : The definitive Guide", O Reilly 2012.
4. Srinath Perera, Thilina Gunarathne, "Hadoop MapReduce Cookbook", PACKT publishing, 2013.

## SRR&CVR GOVT DEGREE(A) COLLEGE:: VIJAYAWADA

## B.Sc(Data Science) II Year Semester –III 2020-21

## BluePrint for BIG DATA TECHNOLOGY

| Section | | Unit-1 | Unit-2 | Unit-3 | Unit-4 | Unit-5 | Total questions | No of questions answered | Marks alloted |
|---|---|---|---|---|---|---|---|---|---|
| Section-A | Short Answer Questions | 2 | 2 | 2 | 2 | 2 | 10 | 5 | 5X 4=20 |
| Section-B | Essay Questions | 2 | 2 | 2 | 2 | 2 | 10 | 5 | 5X8=40 |

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## II BSc (Data Science) Semester -III

## Revised Syllabus 2021-22

### BIG DATA TECHNOLOGY

### MODEL PAPER

**Time: 3hrs** **Max Marks:60**

### Short Answer Questions (Each 4 Marks)

1) What is big ? List out characteristics of Big data?
2) What is structured data in Big data?
3) What is the role of Data node and Name node in HDF's?
4) What is the role of Job tracker and Task tracker in HDF's?
5) Difference between fair schedules and capacity schedules?
6) Explain master and slave for Hadoop multinode cluster?
7) What is the job of MR unit in Map Reduce?
8) Define Total sort & Partial sort in Map Reduce?
9) What is join in Map Reduce and types of joint?
10) What is counter in Map Reduce?

### Essay Questions (Each 8 Marks)

1) Explain the significance of four VS in Big data

2) Explain the role of Apache Hadoop in analyzing Big data?

3) Explain HDF's Architecture with neat diagram?

4) Explain how files are written to HDF's?

5) What is Hadoop Ecosystem? List and define any four elements of Hadoop Ecosystem?

6) How Hadoop runs a Map Reduce job using the classic framework? Explain with neat diagram?

7) Hadoop Map Reduce
   i) Job Submission
   ii) Job Initialization
   iii) Task Assignment
   iv) Task Execution

8) Define Map Reduce? Explain the implementation of a map reduce with suitable example?

9) Describe in brief about API for map reduce framework

10) Implementation of Map reduce concept with suitable example?

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## II BSc (Data Science) Semester -III

## Revised Syllabus 2021-22

# BIG DATA TECHNOLOGY Through Hadoop LAB

1. Implement the following Data Structures in Java
   a) Linked Lists
   b) Stacks
   c) Queues
   d) Set
   e) Map

2. Hadoop Cluster Setup
   (i) Perform setting up and Installing Hadoop in its three operating modes: Standalone

   Pseudo
   distributed
   Fully
   distributed

   (ii) Use web based tools to monitor your Hadoop setup.

3. Implement the following file management tasks in Hadoop:
   - Adding files and directories, List the files and directories
   - Retrieving files
   - Deleting files
   - Copying files from one folder to another in HDFS
   - Copying files from Local File System to HDFS

4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm
5. Write a Map Reduce program that mines weather data (NCDC). Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented. Data available at: ftp://ftp.ncdc.noaa.gov/pub/data/noaa/.
   - Find average, max and min temperature for each year in NCDC data set
   - Filter the readings of a set based on value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.

6. Implement Matrix Multiplication program with Hadoop Map Reduce.

7. Stop word elimination problem:

   Input:

   - A large textual file containing one sentence per line
   - A small file containing a set of stop words (One stop word per line)

   Output:

   - A textual file containing the same sentences of the large input file without the words appearing in the small file.
8. Write a MapReduce Application to implement Combiners
9. Write a MapReduce Application to implement Reduce-side Join
10. Write a MapReduce Application to implement Map-side Join

Outcome:

- Able to develop MapReduce applications to analyze  Big Data related to the real world use cases.
- Able to setup, configure  and manage Hadoop cluster on single node
- Able to access the Hadoop cluster through Web UI.
- Able to track the execution of MapReduce jobs through Web UI
- Able use Joins, partitioner, combiners  as and when needed while developping MapReduce application to analyze the Big Data.

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## II B. Sc (Data Science)

## Revised Syllabus 2021-22

| Semester | Course Code | Course Title | Hours | Credits |
|---|---|---|---|---|
| IV | | DATA MINING AND DATA ANALYSIS | 60 | 3 |

**Objective**

- To learn data analysis techniques.
- To understand Data mining techniques and algorithms.
- Comprehend the data mining environments and application.

**Outcome:** *Students who complete this course will be able to*

1. To understand and demonstrate data mining
2. Compare various conceptions of data mining as evidenced in both research and application.
3. Characterize various kinds of patterns that can be discovered by association rule mining.
4. Evaluate mathematical methods underlying the effective application of data mining.
5. To Analyze the data using statistical methods
6. Gain hands-on skills and experience on data mining tools.

**Unit-I**

Data mining - KDD Vs Data Mining, Stages of the Data Mining Process-Task Primitives, Data Mining Techniques – Data Mining Knowledge Representation. Major Issues in Data Mining – Measurement and Data – Data Preprocessing – Data Cleaning - Data transformation- Feature Selection - Dimensionality reduction

**Unit-II: Predictive Analytics**

Classification and Prediction **-** Basic Concepts of Classification and Prediction, General Approach to solving a classification problem- Logistic Regression - LDA - Decision Trees: Tree Construction Principle – Feature Selection measure – Tree Pruning - Decision Tree construction Algorithm, Random Forest, Bayesian Classification-Accuracy and Error Measures- Evaluating the Accuracy of the classifier / predictor- Ensemble methods and Model selection.

### Unit-III : Classification and Descriptive Analytics

Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

Descriptive Analytics - Mining Frequent Itemsets - Market based model – Association and Sequential Rule Mining

## Unit - IV : Cluster Analysis

Cluster Analysis: Basic concepts and Methods – Cluster Analysis – Partitioning methods – Hierarchical methods – Density Based Methods – Grid Based Methods – Evaluation of Clustering – Advanced Cluster Analysis: Probabilistic model based clustering – Clustering High – Dimensional Data – Clustering Graph and Network Data – Clustering with Constraints- Outlier Analysis**.**

## Unit-V: Factor Analysis

Factor Analysis: Meaning, objectives and Assumptions, Designing a factor analysis, Deriving factors and assessing overall factors, Interpreting the factors and validation of factor analysis.

### References

1. Adelchi Azzalini, Bruno Scapa, "Data Analysis and Data mining" , 2nd Ediiton, Oxford Univeristy Press Inc., 2012.
2. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", 3rd Edition, Morgan Kaufmann Publishers, 2011.
3. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", 10th Edition, TataMc Graw Hill Edition , 2007.
4. G.K. Gupta, "Introduction to Data Mining with Case Studies", 1st Edition, Easter Economy Edition, PHI, 2006.
5. Joseph F Hair, William C Black etal, "Multivariate Data Analysis", Pearson Education, 7th edition, 2013.

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## II B. Sc (Data Science)

## REVISED SYALLABUS 2020-2021

## Semester –III

### Blueprint for DATA MINING AND DATA ANALYSIS

| Section | | Unit-1 | Unit-2 | Unit-3 | Unit-4 | Unit-5 | Total questions | No of questions answered | Marks allotted |
|---|---|---|---|---|---|---|---|---|---|
| Section-A | Short Answer Questions | 2 | 2 | 2 | 2 | 2 | 10 | 5 | 5X 4=20 |
| Section-B | Essay Questions | 2 | 2 | 2 | 2 | 2 | 10 | 5 | 5X8=40 |

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## II B. Sc (Data Science)

### DATA MINING AND DATA ANALYSIS

**Time : 3 hrs** **MODEL PAPER** **Total : 60 M**

### SECTION - A

**Answer any five of the following questions** **5 X 4 = 20 M**

1. Explain the difference between KDD and data mining?
2. List out the applications of data mining?
3. Define DMQL? Basic syntax in DMQL?
4. Explain about data transformation?
5. Write about general approach to solving a classification problem?
6. Write about random sub sampling?
7. Explain about rule based classification?
8. Write about support vector machines?
9. Explain about based clustering and based cluster analysis?
10. Explain about expectation maximization?

### SECTION - B

**Answer the following questions** **5 X 8 = 40 M**

**11a)**Explain the stages of the Data mining process/KDD process ?

Or

b) Explain about Data mining techniques?

12.a) Discuss about Data pre processing?

(or)

b Explain Apriori algorithm with example?

13. a)Write about classification of Decision Tree?

(or)

b) Explain about methods for expressing an attribute test conditions?

14.a) Discuss Bavesian classification?

(or)

b) Write about lazy learners in detail?

15. a)Discuss Density based clustering methods ?

(or)

b) Discuss K-means algorithm?

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## II B. Sc (Data Science)

### DATA MINING AND DATA ANALYSIS

## QUESTION BANK

**UNIT-I**

**Essay Questions 8 Marks**

**1.** Explain about stages of data mining process/KDD.

**2.** .Explain data mining task primitives.

**3.** Explain about data mining techniques.

**Short Questions 4 Marks**

**4.** Difference between KDD and data mining.

**5.** Explain about data mining application.

**6.** Write about data mining knowledge representation.

**UNIT-II**

**Essay Questions 8 Marks**

**7.** Explain about integration of data mining system with a data warehouses and also mention the issues.

**8.** Explain about discretization and generate concept hierarchies.

**9.** Explain mining frequent patterns association.

**10.** What is data pre processing? Explain in detail.

**11.** Explain Apriori algorithm with example?

**Short Questions 4 Marks**

**12.** Write the syntax of data mining query languages.

**13.** What is data cleaning?

**14.** Explain about data transformation.

**UNIT-III**

**Essay Questions 8 Marks**

**15.** Discuss about building a decision tree and working of decision tree.

**16.** Explain about methods for expressing an attribute test conditions?

**17.** How to evaluate the performance of classifier?

**Short Questions 4 Marks**

**18.** Write about general approach to solve a classification problem .

**19.** Explain about measures for selecting the best split.

**20.** What is random sub sampling?

## UNIT-IV

### Essay Questions 8 Marks

**21.** Explain about Bayesian classification

**22.** Discuss about the classification of back propogation.

**23.** Discuss about lazy learners.

### Short Questions 4 Marks

**24.** Explain about rule based classification.

**25.** Write about support vector machines.

**26.** Explain about fuzzy set approaches.

## UNIT-V

### Essay Questions 8 Marks

**27.** Explain about K-means clustering.

**28.** Write about density based clustering method.

**29.** Explain about hierarchical methods and distance based agglomerative and divisible clustering

### Short Questions 4 Marks

**30.** Explain about sting method and also advantages and disadvantages?

**31.** Explain about neural network approach?

**32.** Explain about expectation maximization?

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## II BSc (Data Science) Semester -III

## Revised Syllabus 2021-22

### DATA MINING AND DATA ANALYSIS LAB

1. Data Analysis – Getting to know the Data (Using ORANGE WEKA or R Programming)

    - Parametric – Means, T-Test, Correlation
    - Prediction for numerical outcomes – Linear regression, Multiple Linear Regression
    - Correlation analysis
    - Preparing data for analysis
    - Pre – Processing techniques

2. Data Mining (Using ORANGE WEKA or R Programming)

    - Implement clustering algorithm
    - Implement Association Rule mining
    - Implement classification using
    - Decision tree
    - Back Propagation
    - Logistic Regression
    - Random Forest
    - Naïve Bayes
    - Support Vector Machines
    - Visualization methods

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## II B. Sc (Data Science)

## Revised Syllabus 2021-22

| Semester | Course Code | Course Title | Hours | Credits |
|---|---|---|---|---|
| **IV<br>Paper-V** | | **BIG DATA ACQUISITION AND ANALYSIS** | **60** | **3** |

**Objective**

Learn to develop Hadoop applications for storing processing and analyzing data stored in Hadoop cluster. The course is mainly covering Big Data tools for Data Transformation (Apache PIG), Data Analysis (HIVE) and for handling unstructured data HBase. To Understand the complexity and volume of Big Data and their challenges. To analyse the various methods of data collection. To comprehend the necessity for pre-processing Big Data and their issues

*Outcome*

1. Identify the various sources of Big Data
2. Able to collect and store Big Data from various sources
3. Able to write Pig Scripts- Extract, Transform and Load the data on HDFS
4. Able to write Hive Scripts- Extract, Transform, Load and Analyse the data present in HDFS
5. Able to write scripts to extract data from structured and un-structured data for analytics
6. Able to extract and process semi and un-structured data using HBase

**<u>Unit- I</u>**

**Introduction To Big Data Acquisition:** Big data framework – fundamental concepts of Big Data Management and analytics – Current challenges and trends in Big Data Acquisition. Map Reduce Algorithm- Hadoop Storage [HDFS], Common Hadoop Shell commands - Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode - Hadoop Configuration – Pig Configuration – Hive Configuration - HBase Configuration.

**Unit-II**

**Data Collection And Transmission:** Big data collection – Strategies – Types of Data Sources – Structured Vs Unstructured data – ELT vs ETL – storage infrastructure requirements – Collection methods – Log files – sensors – Methods for acquiring network data (Libcap-based and zero-copy packet capture technology) – Specialized network monitoring softwares (Wireshark, Smartsniff and Winnetcap) – Mobile equipments, Transmission methods, Issues.

## Unit-III

Apache Pig - Introduction - Pig features - Pig Architecture - Pig Execution modes, Pig Grunt shell and Shell commands. Pig Latin Basics: Data model, Data Types, Operators - Pig Latin Commands - Load & Store , Diagnostic Operators, Grouping, Cogroup, Joining, Filtering, Sorting, Splitting - Built-In Functions, User define functions. Pig Execution Modes: Batch Mode – Embedded Mode – Pig Execution in Batch Mode –Use cases - Map Reduce programs with Pig – Pig Vs SQL

## Unit-IV

Hive: Introduction - Hive Features - Hive architecture -Hive Meta store - Hive data types - Hive Tables - Table types - Creating database, Altering database, Create table, alter table, Drop table, Built-In Functions - Built-In Operators, User defined functions(UDFs), View, Pig Vs Hive.

HiveQL–Introduction, HiveQL Select, HiveQL – MapReduce using HiveQL OrderBy, Group By Joins, LIMIT, Distribute By , Cluster By - Sorting And Aggregation – Partitioning: Static & Dynamic partitioning – Index Creation - Bucketing – Analysis of MapReduce execution – Hive Optimization – Setting Hiivng Parameters. Comparison between MapReduce, Hive QL and SQL. UseCase: Implementation of MapReduce programs with HiveQL.

### Unit-V

*Hbase :* ***HBasics, Features of HBase, Concepts, Clients, Example, Hbase Versus RDBMS, Limitations of HBase***

**Big Data Privacy And Applications**: Data Masking – Privately identified Information (PII) – Privacy preservation in Big Data – Popular Big Data Techniques and tools –Applications- Social Media Analytics – Fraud Detection.

## References

1. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications’, John Wiley & Sons, 2014.
2. Tom White “ Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012.
3. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
4. Min Chen. Shiwen Mao, Yin Zhang. Victor CM Leung, Big Data: Related Technologies, Challenges and Future Prospects, Springer, 2014.
5. Michael Minelli, Michele Chambers Ambiga Dhiraj, “Big Data, Big Analytics : Emerging Business Intelligence and Analytic Trends”, John Wiley & Sons, 2013.
6. Raj. Pethuru “ Handbook of Research on Cloud Infrastructures for Big Data Analytics”, IGI Global.

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## II BSc (Computer Science)

## Revised Syllabus 2021-22

## Blueprint for BIG DATA ACQUISITION AND ANALYSIS

| Section | | Unit-1 | Unit-2 | Unit-3 | Unit-4 | Unit-5 | Total questions | No of questions answered | Marks allotted |
|---|---|---|---|---|---|---|---|---|---|
| Section-A | Short Answer Questions | 2 | 2 | 2 | 2 | 2 | 10 | 5 | 5X 4=20 |
| Section-B | Essay Questions | 2 | 2 | 2 | 2 | 2 | 10 | 5 | 5X8=40 |

# SRR & CVR GOVERNMENT DEGREE COLLEGE (A):: VIJAYAWADA

## II B.Sc (Data Science) Semester III 2020-2021

## Model Question Paper

**Subject :BIG DATA ACQUISITION AND ANALYSIS** **Max. Marks: 60**

### Short Answer Questions (Each 4 Marks)

1) Explain current challenges and trends in Big data acquisition ?
2) List out common ‘4’ Hadoop shell commands?
3) List out types of Data sources?
4) Difference between structured and unstructured data?
5) What is a log file in Big data?
6) Explain Relational operators in PIG?
7) What a PIG script for word count?
8) How to create a table by using HIVE QL?
9) List any three difference between HIVE QL and SQL ?
10) List out two components of Hbase?
11) What is the role of Zookeeper in Hbase?

### Essay Questions (Each 8 Marks)

1) Explain briefly about Big data framework?
2) Explain briefly about Map Reduce Algorithm with neat diagram?
3) What is Data source? Explain difference types of Data sources?
4) Explain about Network Monitoring Software tools and types?
5) Write the syntax of a Pig program with suitable example?
6) Discuss in brief running a Pig script in local & distributed mode?
7) How can you create & manage data bases in Hive?
8) List and explain any 6 Data types of Hive with description?
9) Explain how schema Design its done in Hbase?
10) Explain the Hbase Architecture?

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## II B.Sc (Data Science)
## Paper – V
## Big Data Acquisition and Analysis
## QUESTION BANK

### Unit - I

1) Write about Big data framework?

2) Explain current challenges and trends in Big data acquisition ?

3) List out common '4' Hadoop shell commands?

### Unit - II

1) List out types of Data sources?

2) Difference between ETL and ELT?

3) Difference between structured and unstructured data?

4) What is a log file in Big data?

5) How do sensors collect data?

### Unit - III

1) Explain Relational operators in PIG?

2) Write about the key design principles in Pig Latin?

3) What a PIG script for word count?

4) Write about any three PIG commands?

### Unit - IV

1) How to create and manage data base in HIVE?

2) How to create a table by using HIVE QL?

3) Describe the various file formats supported by HIVE?

4) What is HIVE? Specify its role in Hadoop?

5) List any three difference between HIVE QL and SQL ?

### Unit - V

1) List out two components of Hbase?

2) How Hbase is related to HDF’s?

3) What is the role of Zookeeper in Hbase?

4) Explain about Region server in Hbase?

## Long Answers

### Unit - I

1) Explain briefly about Big data framework?

2) Explain briefly about configuration of Hadoop?

3) Explain briefly about Map Reduce Algorithm with neat diagram?

4) How can you create and manage databases in Hadoop?

### Unit - II

1) What is Data source? Explain difference types of Data sources?

2) Explain about transmission methods and issues?

3) Explain about Network Monitoring Software tools and types?

### Unit - III

1) How can you run Pig scripts in local & distribute nodes?

2) Write the syntax of a Pig program with suitable example?

3) Explain Pig Architecture with neat diagram?

4) Discuss Pig latin application flow?

5) Discuss in brief running a Pig script in local & distributed mode?

### Unit - IV

1) How can you create & manage data bases in Hive?

2) Explain Hire Services with Hive web Interface?

3) Compare the Hive with traditional data bases?

4) List and explain any 6 Data types of Hive with description?

5) Compare Hive QL and SQL?

6) Describe Hive Services?

7) Explain about difference Hive data types?

8) Describe in brief about the procedure for installation of Hive?

## **Unit - V**

1) Explain how schema Design its done in Hbase?

2) Explain the Hbase Architecture?

3) Explain briefly about Big data techniques and tools?

# SRR&CVR GOVT DEGREE COLLEGE(A):: VIJAYAWADA

## II B. Sc (Computer Science and Data Science)

## Revised Syllabus 2021-22

| Semester | Course Code | Course Title | Hours | Credits |
|---|---|---|---|---|
| IV<br>Paper-V | | Data Acquisition and Analysis Lab | 30 | 2 |

1. Hadoop Cluster Setup
   - Perform setting up and Installing Hadoop in its three operating modes:
     - standalone
     - Pseudo distributed
     - Fully distributed
   - Use web based tools to monitor your Hadoop setup.

2. Install and Run Pig and also use Pig Shell commands to display the list of files in HDFS
3. Install and Run Hive and also use Hive Shell commands to display the list of files in HDFS
4. Install and Run HBase and also use HBase Shell commands to display the version and user of HBase
5. Use Hive to create, alter, and drop databases, tables, views, functions, and indexes
6. Write and execute Pig Script to Load data into a Pig relation without a schema
7. Write and execute Pig Script Load data into a Pig relation with a schema
8. Write a Pig script to find the word count in a text file
9. Write a Pig Script that mines weather data (NCDC). Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented. Data available at: ftp://ftp.ncdc.noaa.gov/pub/data/noaa/.
   - Find average, max and min temperature for each year in NCDC data set
   - Filter the readings of a set based on value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.
10. Write HiveQL command to create Weather table and to find the year-wise maximum temperature
11. Write a Pig Script to remove null and duplicate values from the given input file.
12. Write Pig scripts to implement filter, project, sort, group by, joins
13. Write Hive Query to create database, managed table, external table, join, index, view, etc
14. Create a table in HBase and insert the data into with Shell
15. Display the data present in a HBase table using Shell