Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce, and Science College Ahmednagar (Autonomous)

(Affiliated to Savitribai Phule Pune University, Pune)

National Education Policy (NEP)
Choice Based Credit System (CBCS)

Programme Framework and Syllabus for

Skill Enhancement Courses:
B.Sc.Data Science
कौशल्य वृद्धी अभ्यासक्रम:
B.Sc.Data Science

Implemented from

Academic Year 2024-25

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Introduction of Skill Enhancement Courses: B.Sc Data Science :

The syllabus has been designed such that the knowledge of fundamental concepts,advanced technologies and specific skills will be developed among students. To understand advanced technologies students should first understand the basic concepts of like R programming, data visualization tools like tableau, data analytics tools Power BI.

In the first year of the B.Sc. Data Science course, the basic concepts of along with the required theoretical understanding have been covered.Students will be acquainted with the Installation of R, Code and Use R Programming Language in R Studio IDE to perform basic tasks on Vectors, Matrices and Data frames,describe key terminologies, concepts and techniques employed in Statistical Analysis.Students will understand how to program in R and how to use R for effective data analysis , graphical capabilities of R, and helps you create your own stunning data visualizations.

During the second year , the syllabus has been designed such that the knowledge of fundamental concepts of data visualization , tools like tableau will be incorporated and specific skills will be developed among students.The Visualization tools help identify trends, outliers, and patterns that may be difficult to discern in raw data, enabling proactive decision-making and problem-solving. Historical data visualizations assist in forecasting future trends and potential outcomes, aiding in strategic planning.

Few of the benefits of Data Visualization Tools

1. Effective Data Visualization is the key to unlock Big Data. It can solve any data inefficiencies and easily and instantly absorb vast amounts of data presented in visual formats.
2. By enabling users to understand data rapidly, visualization can quickly increase the speed of decision making as well. Any business must make fast decisions and not get bogged down by inefficiencies. Timely actions result in averting any losses and benefit from any market condition.
3. A big reveal for any differences in the trends and patterns is vital for any business's survival. It is critical to know what is causing increased losses or what is required to maximize gains.
4. Visualization helps identify errors and inaccuracies in data quickly.
5. Companies can utilize visualization to access real-time information and assist in management functions in a significant manner. Decision-makers can benefit from on-demand data and use visualization to increase the effectiveness of operations and improve productivity.
6. It promotes storytelling in the most compelling way. Visuals are used in the most meaningful way to convey the right message to the audience.

During the second year, IVth semester students will focus on the data analytics tools.
After learning the fundamentals of data analytics, students can then apply their skills by working on projects.They will have to cover the the topics like data ingestion and cleaning, data manipulation, probability and statistics, predictive analytics, and reporting in their projects
Advantages of doing a project in data analytics:

- Practical skill application: They offer hands-on experience, bridging the gap between theoretical knowledge and real-world practice.
- Industry versatility: Data analytics is vital across various sectors. Working on diverse projects broadens your understanding and adaptability.
- Critical thinking: These projects develop your ability to analyze complex issues, identify patterns, and create data-driven solutions.
- Technical proficiency: Engaging in projects hones your skills in key tools and languages, making you a more competent and versatile analyst.
- Effective communication: They teach you to translate complex data insights into understandable and actionable information, a skill highly valued in any professional setting.
- Career advancement: Completing projects enhances your portfolio, showcasing your abilities to potential employers and expanding your career opportunities.

Skill Enhancement Courses: Framework and Course Distribution: Subject: B.Sc. Data Science

Sr. No.	Year	Semester	Level	Course Type	Course Code	Title	Credits
1.	I	II	5.0	SEC-01	SEC-BS-DS 01P	R Programming	02
2.	II	III	5.5	SEC-02	SEC- BS-DS 02P	Data Visualizatio Tool	02
3.	II	IV	6.0	SEC-03	SEC- BS-DS 03P	Data Analytics Tool	02
						Total	06

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Skill Enhancement Courses: B.Sc. Data Science

Title of the Course: R Programming								
Year: I				**Semester: II**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
SEC-01	SEC- BS-DS 01P	00	02	02	30	15	35	50

Learning Objectives:

- The overall logical thinking as a base of data science will be improved.
- Student will have skill of result interpretation.

Course Outcomes (Cos): On completion of all the practical's

- Student will have sufficient computationalskill through software and programming.
- Student will understand the difference in data visualization by R.
- Student will understand the difference in output of analysis by R.
- The overall logical thinking as a base of data science will be improved.

Detailed Syllabus:

Section I: Fundamentals of R

Overview of R Programming
Downloading and installing
Help of Function
Viewing documentation
General issues in R
Package Management
Introduction to Data Analysis
Overview of Data Analytics
Need of Data Analytics
Nature of Data
Classification of Data: Structured, Semi-Structured, Unstructured
Characteristics of Data, Applications of Data Analytics

Section II:

UNIT I : Data Inputting in R and Data visualization

R Programming Basics
Data Types
Subsetting
Writing data

Reading from csv files
Creating a vector and vector operation
Initializing data frame
Control structure
Re-directing R Output
Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files.
Working with R Charts and Graphs: Histograms,Boxplots,Bar Charts, Line Graphs, Scatterplots, Pie Charts

Assignments:

Creating bar chart and dot plot
Creating histogram and box plot
Plotting with base graphics
Plotting and coloring in R

UNIT II:Basic Statistics

Computing Basic Statistics
Comparing means of two samples
Testing a proportion
Data Munging Basics

UNIT III: Functions and Programming in R

Flow control: For loop
If condition
Debugging tools

UNIT IV: Data Manipulation in R

List Management
Data Transformation
Merging Data Frames
Outlier Detection
Combining multiple vectors

Suggested Readings/Material:

1. Crawley, M.J. (2006). Statistics – An introduction using R. John Wiley London.
2. Purohit, S.G., Deshmukh, S.R. and Gore, S.D., (2015). Statistics using R. Alpha ScienceInternational.
3. Verzani, J., (2018). Using R for introductory statistics. CRC press.
4. Schumacker, R.E., (2014). Learning statistics using R. Sage Publications