

## Course Schedule

### NTP on “Introduction to R Programming Language for Data Analytics in Audit”

**24-06-2024 to 28-06-2024**

(For IA&AD officers)

Date	Topic	Time (in hrs)
<b>24-06-2024 (Day-1)</b>		
<b>Registration from 9:45 am</b>		
	Inauguration	10:00 – 10:15
<b>Session 1 (Day 1)</b>	<b>Session 1: Introduction to R Programming</b> Introduction to R and RStudio, Installing R and RStudio, Basic R syntax and commands	10:15-11:15
	<b>Mr. Chandersheel, AAO , CDMA, O/o C&amp;AG of India, New Delhi</b>	
	<b>Tea Break</b>	<b>11:15 – 11:45</b>
<b>Session 2 (Day 1)</b>	<b>Session 2: Data Types and Object Types</b> Scalars, vectors, matrices, and data frames, Lists and factors	11:45 – 13:00
	<b>Mr. Chandersheel, AAO , CDMA, O/o C&amp;AG of India, New Delhi</b>	
	<b>Lunch Break</b>	<b>13:00 – 14:00</b>
<b>Session 3 (Day 1)</b>	<b>Session 3: Basic Operations and Functions</b> Arithmetic operations and assignment, Basic functions: sum, mean, median, etc., Creating and using custom functions	14:00 – 15:15
	<b>Ms. Sowmini S., SAO, RCB&amp;KC, Bengaluru</b>	
	<b>Tea Break</b>	<b>15:15 – 15:45</b>
<b>Session 4 (Day 1)</b>	<b>Session 4: Control Structures</b> If-else statements, For and while loops, Apply family of functions	15:45 – 17:00
	<b>Ms. Sowmini S., SAO, RCB&amp;KC, Bengaluru</b>	
<b>25-06-2024 (Day-2)</b>		
<b>Session 1 (Day 2)</b>	<b>1: Reading and exporting Data in and out of R</b> <b>2: Introduction to dplyr</b>  <ul style="list-style-type: none"> <li>• Reading CSV and Excel files using `readr` and `readxl`</li> <li>• Writing CSV files out of R</li> <li>• Overview of dplyr package</li> <li>• Select, filter, mutate, arrange, and summarize functions</li> </ul>	10:00 – 11:15
	<b>Ms. Sowmini S., SAO, RCB&amp;KC, Bengaluru</b>	
	<b>Tea Break</b>	<b>11:15 – 11:45</b>
<b>Session 2 (Day 2)</b>	<b>Advanced dplyr Functions</b>  <ul style="list-style-type: none"> <li>• Group_by and summarize for grouped data</li> </ul>	11:45 – 13:00

	<ul style="list-style-type: none"> <li>Joins and merging datasets</li> </ul>	
	<b>Ms. Sowmini S., SAO, RCB&amp;KC, Bengaluru</b>	
	<b>Lunch Break</b>	<b>13:00 – 14:00</b>
<b>Session 3 (Day 2)</b>	<b>Introduction to tidyr</b> <ul style="list-style-type: none"> <li>Overview of tidyr package</li> <li>pivoting with pivot_longer and pivot_wider, separate and unite</li> <li>Handling missing values</li> </ul>	14:00 – 15:15
	<b>Mr. Anil Goyal , Sr AO, CDMA, O/o C&amp;AG of India, New Delhi</b>	
	<b>Tea Break</b>	<b>15:15 – 15:45</b>
<b>Session 4 (Day 2)</b>	<b>String Manipulation in R</b> <ul style="list-style-type: none"> <li>Basic string manipulation in R</li> <li>Reading strings, Unicode text</li> <li>Text extraction, replacement, pattern matching, etc.</li> </ul>	15:45 – 17:00
	<b>Mr. Anil Goyal , Sr AO, CDMA, O/o C&amp;AG of India, New Delhi</b>	
<b>26-06-2024 (Day 03)</b>		
<b>Session 1 (Day-3)</b>	<b>Data Visualization in Audit with ggplot2: Introduction to ggplot2</b>  (Overview of ggplot2 package, Basic structure of a ggplot2 graph (ggplot, aes, geom))	10:00 – 11:15
	<b>Mr. Gowthaman R, Director, O/o the DGA (I&amp;CA), New Delhi</b>	
	<b>Tea Break</b>	<b>11:15 – 11:45</b>
<b>Session 2 (Day-3)</b>	<b>Data Visualization in Audit with ggplot2-Creating Basic Plots</b>  (Scatter plots, line plots, bar charts, and histograms)	11:45 – 13:00
	<b>Mr. Gowthaman R, Director, O/o the DGA (I&amp;CA), New Delhi</b>	
	<b>Lunch Break</b>	<b>13:00 – 14:00</b>
<b>Session 3 (Day 3)</b>	<b>Data Visualization in Audit with ggplot2:- Customizing Plots</b>  (Themes, labels, and annotations, Faceting for multi-panel plots)	14:00 – 15:15
	<b>Mr. Gowthaman R, Director, O/o the DGA (I&amp;CA), New Delhi</b>	
	<b>Tea Break</b>	<b>15:15 – 15:45</b>
<b>Session 4 (Day 3)</b>	<b>Data Visualization in Audit with ggplot2: Advanced ggplot2 Techniques</b>  (Using ggplot2 with dplyr for complex visualizations, Plotting with multiple layers and advanced geoms )	15:45 – 17:00
	<b>Mr. Gowthaman R, Director, O/o the DGA (I&amp;CA), New Delhi</b>	

<b>27-06-2024 (Day-4)</b>		
<b>Session 1 (Day-4)</b>	<b>Statistical Analysis in Audit: Introduction to Simple Linear Regression</b> { Basic concepts of regression, Fitting a linear model in R (lm function)}	10:00 – 11:15
	<b>Mr. Chandersheel, AAO , CDMA, O/o C&amp;AG of India, New Delhi</b>	
	Tea Break	<b>11:15 – 11:45</b>
<b>Session 2 (Day-4)</b>	<b>Statistical Analysis in Audit: Evaluating Linear Models</b> (Interpreting model output, Diagnostics and goodness-of-fit measures)	11:45 – 13:00
	<b>Mr. Chandersheel, AAO , CDMA, O/o C&amp;AG of India, New Delhi</b>	
	<b>Lunch Break</b>	<b>13:00 – 14:00</b>
<b>Session 3 (Day 4)</b>	<b>Statistical Analysis in Audit: Introduction to Time Series Analysis</b> (Basic concepts of time series data, Plotting time series data)	14:00 – 15:15
	<b>Ms. Nithi Sethi, Consultant (CDMA)</b>	
	Tea Break	<b>15:15 – 15:45</b>
<b>Session 4 (Day 4)</b>	<b>Statistical Analysis in Audit: Time Series Modeling</b> (Decomposing time series, Simple forecasting methods (moving averages, exponential smoothing))	15:45 – 17:00
	<b>Ms. Nithi Sethi, Consultant (CDMA)</b>	
<b>28-06-2024 (Day-5)</b>		
<b>Session 1 (Day-1)</b>	<b>Case Study 1 - Data Transformation and Wrangling in Audit</b> (Real-world dataset, Applying dplyr and tidyr for data cleaning)	10:00 – 11:15
	<b>Mr. Anil Goyal , Sr AO, CDMA, O/o C&amp;AG of India, New Delhi</b>	
	Tea Break	<b>11:15 – 11:45</b>
<b>Session 2 (Day-4)</b>	<b>Case Study 2 - Data Visualization in Audit</b> (Real-world dataset, Creating informative visualizations with ggplot2)	11:45 – 13:00
	<b>Mr. Anil Goyal , Sr AO, CDMA, O/o C&amp;AG of India, New Delhi</b>	
	<b>Lunch Break</b>	<b>13:00 – 14:00</b>
<b>Session 3 (Day 4)</b>	<b>Case Study 3 – Sampling using R</b>	14:00 – 15:15
	<b>Mr. Anil Goyal , Sr AO, CDMA, O/o C&amp;AG of India, New Delhi</b>	
	<b>Valediction</b>	15:15 Hrs