

SAS Clinical Programming Fundamentals

1. BASE SAS PROGRAMMER (Hours: 52)

This course is for users who want to learn how to write SAS programs to access, explore, prepare, and analyze data. It is the entry point to learning SAS programming for data science, machine learning, and artificial intelligence. It is a prerequisite to many other SAS courses. If you do not plan to write SAS programs and you prefer a point-and-click interface, you should attend the *SAS Enterprise Guide 1: Querying and Reporting* course.

Learn how to

- use SAS Studio and SAS Enterprise Guide to write and submit SAS programs
- access SAS, Microsoft Excel, and text data
- explore and validate data
- prepare data by sub setting rows and computing new columns
- analyze and report on data
- export data and results to Excel, PDF, and other formats
- use SQL in SAS to query and join tables.
- understand and control DATA step processing
- create an accumulating column and process data in groups
- manipulate data with functions
- convert column type
- create custom formats
- concatenate and merge tables
- process repetitive code
- restructure tables.

Prerequisites

Before attending this course, you should have experience using computer software. Specifically, you should be able to

- understand file structures and system commands on your operating systems
- access data files on your operating systems.

No prior SAS experience is needed.

Software Addressed

Base SAS This course also addresses SAS/ACCESS Interface to PC Files.

Course Contents

Essentials

- the SAS programming process

- using SAS programming tools
- understanding SAS syntax

Accessing Data

- understanding SAS data
- accessing data through libraries
- importing data into SAS

Exploring and Validating Data

- exploring data
- filtering rows
- formatting columns
- sorting data and removing duplicates

Preparing Data

- reading and filtering data
- computing new columns
- conditional processing

Analyzing and Reporting on Data

- enhancing reports with titles, footnotes, and labels
- creating frequency reports
- creating summary statistics reports

Exporting Results

- exporting data
- exporting reports

Using SQL in SAS

- using Structured Query Language in SAS
- joining tables using SQL in SAS

Controlling DATA Step Processing

- setting up for this course
- understanding DATA step processing
- directing DATA step output

Summarizing Data

- creating an accumulating column

- processing data in groups

Manipulating Data with Functions

- understanding SAS functions and CALL routines
- using numeric and date functions
- using character functions
- using special functions to convert column type

Creating Custom Formats

- creating and using custom formats
- creating custom formats from tables

Combining Tables

- concatenating tables
- merging tables
- identifying matching and nonmatching rows

Processing Repetitive Code

- using iterative DO loops
- using conditional DO loops

Restructuring Tables

- restructuring data with the DATA step
- restructuring data with the TRANSPOSE procedure

Array Processing in Data Step

- Introduction to table Lookup Techniques
- One-Dimensional Arrays
- Multidimensional Arrays
- Loading a Multidimensional Array from a SAS Data set

2. Introduction to Clinical Trials Research (Hours: 2)

- Environment and Guiding Principles
- Preparing Clinical Trial Data
- Classifying Clinical Trial Data

3. CDISC Study Data Tabulation Model (SDTM) Guidelines (Hours: 3)

- Introduction to Clinical Data Interchange Standards Consortium (CDISC)
- Fundamentals of the Study Data Tabulation Model (SDTM)

- The General Observations Class
 - Interventions Class
 - Events Class
 - Findings Class
- Datasets Other than General Observation
 - Models for Special-Purpose Domains
 - Trial Design Model (TDM) Datasets
 - Relationship Datasets
 - Study Reference Datasets
- Assumptions for Domain Models

4. Implementing the CDISC SDTM with Base SAS (Hours: 10)

- Base SAS Programs for SDTM Conversions
- Building SDTM Datasets
 - Building the Special-Purpose DM and SUPPDM Domains
 - Building the AE Events Domain
 - Building the LB Finding Domain

5. CDISC Analysis Dataset Model (ADaM) Guidelines (Hours: 2)

- Fundamentals of ADaM
- Subject-Level Analysis Dataset (ADSL)
- Basic Data Structure (BDS)

6. Implementing the CDISC ADaM with Base SAS (Hours: 10)

- Building the Subject-Level Analysis Dataset (ADSL)
- Building the Adverse Events Analysis Dataset (ADAE)

7. SAS SQL 1: Essentials (Hours: 20)

This course teaches you how to process SAS data using Structured Query Language (SQL).

Learn how to

- query and subset data
- summarize and present data
- combine tables, including complex joins and merges
- create and modify table views and indexes
- replace multiple DATA and PROC steps with one SQL query.

Course Materials

Registered students will be able to download the course materials from the Web prior to the class. These materials may include a .pdf copy of the course notes, a .pdf copy of the course workbook, and exercise files. To understand how to participate in a Live Web class and what to expect, print and review the [Quick Reference](#) (.pdf)

Software Addressed

Base SAS This course is appropriate for students who are using SAS 9 software.

Course Contents

Introduction

- overview of SAS Foundation
- course logistics
- course data files
- introducing the Structured Query Language

Basic Queries

- overview of the SQL procedure
- specifying columns
- specifying rows

Displaying Query Results

- presenting data
- summarizing data

SQL Joins

- introduction to SQL joins
- inner joins
- outer joins
- complex SQL joins

Subqueries

- noncorrelated subqueries
- in-line views

Set Operators

- introduction to set operators
- the UNION operator
- the OUTER UNION operator
- the EXCEPT operator
- the INTERSECT operator

Creating Tables and Views

- creating tables with the SQL procedure
- creating views with the SQL procedure

Advanced PROC SQL Features

- dictionary tables and views
- using SQL procedure options
- interfacing PROC SQL with the macro language

Learning More

- SAS resources
- beyond this course

8. SAS Macro Language 1: Essentials (Hours: 20)

This course focuses on the components of the SAS macro facility and how to design, write, and debug macro systems. Emphasis is placed on understanding how programs with macro code are processed.

Learn how to

- perform text substitution in SAS code
- automate and customize the production of SAS code
- conditionally or iteratively construct SAS code
- use macro variables and macro functions.

Course Materials

Registered students will be able to download the course materials from the Web prior to the class. These materials may include a .pdf copy of the course notes, a .pdf copy of the course workbook, and exercise files. To understand how to participate in a Live Web class and what to expect, print and review the [Quick Reference](#) (.pdf).

Software Addressed

Base SAS This course is appropriate for students who are using SAS 9 software.

Course Contents

Introduction

- course logistics
- purpose of the macro facility
- program flow

Macro Variables

- introduction to macro variables
- automatic macro variables
- macro variable references
- user-defined macro variables
- delimiting macro variable references

- macro functions

Macro Definitions

- defining and calling a macro
- macro parameters

DATA Step and SQL Interfaces

- creating macro variables in the DATA step
- indirect references to macro variables
- creating macro variables in SQL

Macro Programs

- conditional processing
- parameter validation
- iterative processing
- global and local symbol tables

Learning More

- SAS resources
- beyond this course

Supplemental Materials

- program flow

9. [Implementing the CDISC SDTM and ADaM with Macro Programming and SQL \(Hours: 5\)](#)

- Use SQL Procedure to create Data sets
 - Use CREATE TABLE query to create Study Tabulations and Analysis Datasets
 - Use Join and Union clauses to combine multiple tables
- Use Macro Programming to automate tasks
 - Create a macro to derive ISO8601 date string from SAS date or datetime component variables
 - Create a macro to derive SDTM study day variable
 - Create a macro to calculate change from baseline

[SAS Certification exams & Credentials](#)

This course is mapped to below credential:

1. SAS Certified Specialist: Base Programming Using SAS 9.4

Participants will be awarded SAS certified digital badges for it on clearing the exam

Besides participants will also be awarded participation certificate & Learn SAS digital badges for –

1. SAS Programming 1: Essentials
2. SAS Programming 2: Data Manipulation Techniques
3. SAS SQL1: Essentials
4. SAS Macro Language 1: Essentials
5. SAS Clinical Programming Fundamentals