SAS

Curriculum

MODULE - FOUNDATION & ADVANCE COURSE ON SAS® 9.2

This course is for users who want to learn how to write SAS programs. It is the entry point to learning SAS programming and is a prerequisite to many other SAS courses. This course helps you prepare you for the following certification.

Exam: SAS Base Programming Exam for SAS 9.2

Exam: SAS advance Programming Exam for SAS 9.2

In addition to this, Projects related to field of interest will be given to each student where they will have access to real time data and specification for practice.

COURSE TOPICS

CHAPTER 1: INTRODUCTION TO SAS

- INTRODUCTION
- NEED FOR SAS
- WHO USES SAS
- WHAT IS SAS?
- OVERVIEW OF BASE SAS SOFTWARE
- DATA MANAGEMENT FACILITY
- STRUCTURE OF SAS DATASET
- SAS PROGRAM
- PROGRAMMING LANGUAGE
- ELEMENTS OF THE SAS LANGUAGE
- RULES FOR SAS STATEMENTS
- RULES FOR MOST SAS NAMES
- SPECIAL RULES FOR VARIABLE NAMES
- TYPES OF VARIABLES
- DATA ANALYSIS AND REPORTING UTILITIES
- TRADITIONAL OUTPUT
- WAYS TO RUN SAS PROGRAMS
- SAS WINDOWING ENVIRONMENT
- NONINTERACTIVE MODE
- BATCH MODE
- INTERACTIVE LINE MODE
- RUNNING PROGRAMS IN THE SAS WINDOWING ENVIRONMENT

CHAPTER 2: HOW SAS WORKS

- WRITING YOUR FIRST SAS PROGRAM
- A SIMPLE PROGRAM TO READ RAW DATA AND PRODUCE A REPORT
- ENHANCING THE PROGRAM
- MORE ON COMMENT STATEMENTS

- INTERNAL PROCESSING IN SAS
- HOW SAS WORKS
- THE COMPILATION PHASE
- THE EXECUTION PHASE
- PROCESSING A DATA STEP: A WALKTHROUGH
- CREATING THE INPUT BUFFER AND THE PROGRAM DATA VECTOR
- WRITING AN OBSERVATION TO THE SAS DATA SET
- FOUR TYPES OF SAS LIBRARIES
- SAS LIBRARIES
- WORK LIBRARY
- SASHELP LIBRARY
- SASUSER LIBRARY

CHAPTER 3: READING RAW DATA INTO SAS

- WHAT IS RAW DATA
- DEFINITIONS
- DATA VALUES
- NUMERIC VALUE
- CHARACTER VALUE
- STANDARD DATA
- NONSTANDARD DATA
- NUMERIC DATA
- CHARACTER DATA
- CHOOSING AN INPUT STYLE
- LIST INPUT
- MODIFIED LIST INPUT
- COLUMN INPUT
- FORMATTED INPUT
- NAMED INPUT
- INSTREAM DATA
- CREATING MULTIPLE RECORDS FROM SINGLE INPUT ROW
- READING DATA FROM EXTERNAL FILES
- READING BLANK SEPARATED VALUES (LIST OR FREE FORM DATA):
- READING RAW DATA SEPARATED BY COMMAS (.CSV FILES):
- READING IN RAW DATA SEPARATED BY TABS (.TXT FILES):
- USING INFORMATS WITH LIST INPUT
- SUPPLYING AN INFORMAT STATEMENT WITH LIST INPUT
- USING LIST INPUT WITH EMBEDDED DELIMITERS
- READING RAW DATA THAT ARE ALIGNED IN COLUMNS: o METHOD 1: COLUMN INPUT o METHOD 2: FORMATTED INPUT

- USING MORE THAN ONE INPUT STATEMENT: THE SINGLE TRAILING @
- READING COLUMN DATA THAT IS ON MORE THAN ONE LINE MIXED-STYLE INPUT:
- INFILE OPTIONS FOR SPECIAL SITUATIONS
- FLOWOVER
- MISSOVER
- TRUNCOVER
- PAD
- STOPOVER
- USING LRECL TO READ VERY LONG LINES OF RAW DATA
- CHECKING YOUR DATA AFTER IT HAS BEEN READ INTO SAS

CHAPTER 4: READING DATA FROM A DATASET

- INTRODUCTION
- SET STATEMENT OVERVIEW
- AUTOMATIC VARIABLES IN SAS
- INTERLEAVE MULTIPLE SAS DATA SETS
- COMBINE MULTIPLE SAS DATA SETS
- CREATING & MODIFYING VARIABLES
- CREATING MULTIPLE DATASETS IN A SINGLE DATA-STEP
- SUBSETTING OBSERVATIONS
- CONDITIONAL SAS STATEMENTS
- LOGICAL AND SPECIAL OPERATORS
- THE SAS SUPERVISOR AND THE SET STATEMENT
- EFFICIENCY AND THE SET STATEMENT
- KNOW YOUR DATA
- SET STATEMENT DATA SET OPTIONS
- DROP AND KEEP OPTIONS
- RENAME OPTION
- FIRSTOBS AND OBS OPTIONS
- IN OPTION –
- WHERE OPTION –
- OTHER SET STATEMENT OPTIONS
- END OPTION
- KEY OPTION
- NOBS OPTION
- POINT OPTION
- DO LOOPS AND THE SET STATEMENT
- INTRODUCTION TO RETAIN STATEMENT
- CARRY OVER VALUES FROM ONE OBSERVATION TO ANOTHER
- COMPARE VALUES ACROSS OBSERVATIONS

- ASSIGN INITIAL VALUES
- DETERMINING COLUMN ORDER IN OUTPUT DATASET
- SAS SYSTEM OPTIONS

CHAPTER 5: READING DATA FROM A DATASET

- INPUT SAS DATA SET FOR EXAMPLE
- SELECTING OBSERVATIONS FOR A NEW SAS DATA SET
- DELETING OBSERVATIONS BASED ON A CONDITION
- ACCEPTING OBSERVATIONS BASED ON A CONDITION
- COMPARING THE DELETE AND SUBSETTING IF STATEMENTS
- METHODS OF CREATING NEW DATA SETS WITH A SUBSET
- SUBSETTING RECORDS FROM AN EXTERNAL FILE WITH A SUBSETTING IF STATEMENT
- SUBSETTING OBSERVATIONS IN A DATA STEP WITH A WHERE STATEMENT
- SUBSETTING OBSERVATIONS IN A PROC STEP WITH A WHERE STATEMENT
- SUBSETTING OBSERVATIONS IN PROC SQL
- DIFFERENCE BETWEEN IF AND WHERE

CHAPTER 6: SAS INFORMATS AND FORMATS

- OVERVIEW
- USING SAS INFORMATS
- INPUT STATEMENT
- INPUT FUNCTION
- INPUTN AND INPUTC FUNCTIONS
- ATTRIB AND INFORMAT STATEMENTS
- USING SAS FORMATS
- FORMAT STATEMENT IN PROCEDURES
- PUT STATEMENT
- PUT FUNCTION
- PUTN AND PUTC FUNCTIONS
- BESTw. Format
- ADDITIONAL COMMENTS

CHAPTER 7: SAS FUNCTIONS

- CATEGORIES OF FUNCTIONS
- SAS CHARACTER FUNCTIONS
- FUNCTIONS THAT CHANGE THE CASE OF CHARACTERS
- UPCASE
- LOWCASE
- PROPCASE

- FUNCTIONS THAT REMOVE CHARACTERS FROM STRINGS
- FUNCTION: COMPBL
- FUNCTION: COMPRESS
- FUNCTIONS THAT SEARCH FOR CHARACTERS
- FUNCTION: ANYALNUM
- FUNCTION: ANYALPHA
- FUNCTION: ANYDIGIT
- FUNCTION: ANYPUNCT
- FUNCTION: ANYSPACE
- FUNCTION: NOTALNUM
- FUNCTION: NOTALPHA
- FUNCTION: NOTDIGIT
- FUNCTION: NOTUPPER
- FUNCTIONS THAT SEARCH STRINGS
- FIND AND FINDC
- INDEX, INDEXC, AND INDEXW
- FUNCTIONS TO VERIFY DATA
- FUNCTION VERIFY
- FUNCTIONS THAT EXTRACT PARTS OF STRINGS
- FUNCTION: SUBSTR (ON THE LEFT-HAND SIDE OF THE EQUAL SIGN)
- FUNCTION: SUBSTRN
- FUNCTIONS THAT JOIN TWO OR MORE STRINGS TOGETHER
- FUNCTION: CAT
- FUNCTION: CATS
- FUNCTION: CATT
- FUNCTION: CATX
- FUNCTIONS THAT REMOVE BLANKS FROM STRINGS
- FUNCTION: LEFT
- FUNCTION: RIGHT
- FUNCTION: TRIM
- FUNCTION: TRIMN
- FUNCTION: STRIP
- FUNCTIONS THAT COMPARE STRINGS
- FUNCTION: COMPARE
- FUNCTIONS THAT DIVIDE STRINGS INTO "WORDS"
- FUNCTION: SCAN
- FUNCTION: SCANQ

- FUNCTIONS THAT SUBSTITUTE LETTERS OR WORDS IN STRINGS
- FUNCTION: TRANSLATE
- FUNCTION: TRANWRD
- FUNCTIONS THAT COMPUTE THE LENGTH OF STRINGS
- FUNCTION: LENGTH
- FUNCTION: LENGTHC
- FUNCTION: LENGTHM
- FUNCTION: LENGTHN
- FUNCTIONS THAT COUNT THE NUMBER OF LETTERS OR SUBSTRINGS IN A STRING
- FUNCTION: COUNT
- FUNCTION: COUNTC
- MISCELLANEOUS STRING FUNCTIONS
- FUNCTION: MISSING
- FUNCTION: REPEAT
- FUNCTION: REVERSE
- SAS DATE AND TIME FUNCTIONS
- INTRODUCTION
- WHAT IS A SAS DATE AND TIME LITERAL?
- DATE AND TIME FUNCTIONS
- FUNCTINS TO CREATE DATE AND TIME VALUES
- FUNCTIONS TO TAKIE DATETIME VALUES APART
- FUNCTIONS TO GET QUARTER ,YEAR OR DAY OF THE DATE
- FUNCTIONS THAT WORK WITH INTERVALS
- USING FORMATS FOR DATE AND TIME
- SYSTEM OPTIONS FORDATE AND TIME

CHAPTER 8: AN INTRODUCTION TO ARRAYS AND ARRAY PROCESSING

- WHY DO WE NEED ARRAYS?
- BASIC ARRAY CONCEPTS
- ARRAY STATEMENT
- ARRAY REFERENCES
- VARIABLE NAME ARRAY REFERENCE
- USING ARRAY INDEXES
- ONE DIMENSION ARRAYS
- MULTI-DIMENSION ARRAYS
- TEMPORARY ARRAYS
- SORTING ARRAYS
- Determining Array Bounds: LBOUND and HBOUND Functions

- WHEN TO USE ARRAYS
- COMMON ERRORS AND MISUNDERSTANDINGS
- INVALID INDEX RANGE
- FUNCTION NAME AS AN ARRAY NAME
- ARRAY REFERENCED IN MULTIPLE DATA STEPS, BUT DEFINED IN ONLY ONE

CHAPTER 9: BY - GROUP PROCESSING

- DEFINITIONS FOR BY-GROUP PROCESSING
- BY-GROUP PROCESSING
- BY VALUE
- BY GROUP
- FIRST.VARIABLE AND LAST.VARIABLE
- MODIFYING SAS DATA SETS: EXAMPLES.
- INVOKING BY-GROUP PROCESSING
- PREPROCESSING INPUT DATA FOR BY-GROUP PROCESSING
- SORTING OBSERVATIONS FOR BY-GROUP PROCESSING
- INDEXING FOR BY-GROUP PROCESSING
- HOW THE DATA STEP IDENTIFIES BY GROUPS
- PROCESSING OBSERVATIONS IN A BY GROUP
- HOW SAS DETERMINES FIRST.VARIABLE AND LAST.VARIABLE
- PROCESSING BY-GROUPS IN THE DATA STEP
- OVERVIEW
- PROCESSING BY-GROUPS CONDITIONALLY
- DATA NOT IN ALPHABETIC OR NUMERIC ORDER
- DATA GROUPED BY FORMATTED VALUES

CHAPTER 10: OVERVIEW OF METHODS FOR COMBINING SAS DATA SETS

- DEFINITIONS
- CONCATENATING
- INTERLEAVING
- ONE-TO- ONE READING OR ONE-TO-ONE MERGING
- MATCH-MERGING
- UPDATING
- MODIFYING
- DEFINITIONS FOR READING, COMBINING, AND MODIFYING SAS DATA SETS
- READING A SAS DATA SET
- COMBINING SAS DATA SETS
- MODIFYING SAS DATA SETS
- OVERVIEW OF TOOLS
- READING SAS DATA SETS

- READING A SINGLE SAS DATA SET
- READING FROM MULTIPLE SAS DATA SETS
- COMBINING SAS DATA SETS: BASIC CONCEPTS
- ONE-TO-ONE
- ONE-TO-MANY AND MANY-TO-ONE
- MANY-TO-MANY
- ACCESS METHODS: SEQUENTIAL VERSUS DIRECT
- SEQUENTIAL ACCESS
- DIRECT ACCESS
- ONE-TO-ONE READING
- DATA STEP PROCESSING DURING A ONE-TO-ONE READING
- ONE-TO-ONE MERGING
- MATCH-MERGING
- UPDATING WITH THE UPDATE AND THE MODIFY STATEMENTS :
- DEFINITIONS
- SYNTAX OF THE UPDATE STATEMENT
- SYNTAX OF THE MODIFY STATEMENT –
- UPDATING WITH NONMATCHED OBSERVATIONS, MISSING VALUES, AND NEW VARIABLES
- USING AN INDEX WITH THE MODIFY STATEMENT

CHAPTER 11: SAS PROCEDURES

- INTRODUCTION
- THE ANATOMY OF A PROC
- THE PROC STATEMENT
- TITLE AND FOOTNOTE STATEMENTS
- BY STATEMENT
- LABEL STATEMENT
- FORMAT STATEMENT
- RUN OR QUIT STATEMENT
- DESCRIPTION OF DATA USED IN REPORTS
- SAS REPORTING PROCEDURES
- PROCS FOR ALL THAT DETAIL
- USING PROC PRINT
- USING PROC SQL
- PROC REPORT
- PROCS THAT SUMMARIZE
- USING PROC CHART

- USING PROC FREQ
- USING PROC MEANS
- USING PROC UNIVARIATE
- INTRODUCTION TO PROC TABULATE
- DATA MANIPULATION AND MANAGEMENT PROCEDURE o
- PROC SORT
- PROC DATASETS
- PROC FORMAT
- PROC CONTENTS
- THER IMPORTANT PROCS
- PROC TRANSPOSE
- PROC PRINTTO
- PROC COMPARE
- PROC APPEND
- PROC IMPORT & PROC EXPORT

CHAPTER 12: INTRODUCTION TO PROC SQL

- **INTRODUCTION**
- WHY LEARN PROC SQL?
- SELECT STATEMENT
- THE SELECT STATEMENT SYNTAX
- A SIMPLE PROC SQL
- A COMPLEX PROC SQL
- LIMITING INFORMATION ON THE SELECT
- CREATING NEW VARIABLES
- THE CALCULATED OPTION ON THE SELECT
- USING LABELS AND FORMATS
- THE CASE EXPRESSION ON THE SELECT
- ADDITIONAL SELECT STATEMENT CLAUSES
- REMERGING
- REMERGING FOR TOTALS
- CALCULATING PERCENTAGE
- SORTING THE DATA IN PROC SQL
- SORT ON NEW COLUMN
- SUBSETTING USING THE WHERE
- INCORRECT WHERE CLAUSE
- WHERE ON COMPUTED COLUMN
- SELECTION ON GROUP COLUMN

- USE HAVING CLAUSE
- CREATING NEW TABLES
- JOINING DATASETS USING PROC SQL
- INNER JOIN
- JOINING THREE OR MORE TABLES
- OUTER JOINS
- INCLUDING NONMATCHING ROWS WITH THE RIGHT OUTER JOIN
- SELECTING ALL ROWS WITH THE FULL OUTER JOIN
- CONCATENATING QUERY RESULTS

CHAPTER 13: AN INTRODUCTION TO SAS MACROS

- INTRODUCTION
- SAS MACRO OVERVIEW
- TRADITIONAL SAS PROGRAMMING
- THE SAS MACRO LANGUAGE
- MACRO LANGUAGE COMPONENTS
- MACRO VARIABLES
- MACRO STATEMENTS
- MACRO PROCESSOR FLOW
- AUTOMATIC MACRO VARIABLES
- MACRO DEBUGGING OPTIONS
- WHAT IS A MACRO?
- DEFINING AND USING MACROS
- POSITIONAL MACRO PARAMETERS
- KEYWORD MACRO PARAMETERS
- CONDITIONAL MACRO COMPILATION
- THE %DO STATEMENT
- SAS DATA STEP INTERFACES

CHAPTER 14: THE OUTPUT DELIVERY SYSTEM (ODS)

- INTRODUCTION
- CREATNG VARIOUS TYPES OF REPORTS LISTING OUTPUT
- OTHER DESTINATIONS
- HTML
- PDF AND POSTSCRIPT
- RTF FILES
- MICROSOFT EXCEL
- ADDING STYLE TO YOUR REPORTS
- LOCATE EXISTING STYLES

- ODS STYLE= OPTION
- CUSTOMIZE YOUR REPORTS
- ODS SELECT; AND ODS EXCLUDE;
- OTHER CUSTOMIZATIONS
- ODS PROCLABEL= ;
- ODS PROCTITLE; AND ODS NOPROCTITLE;
- ADVANCED TECHNIQUES
- ODS DOCUMENT
- PROC TEMPLATE

CHAPTER 15: INTRODUCTION TO DIAGNOSING AND AVOIDING ERRORS

- INTRODUCTION
- UNDERSTANDING HOW THE SAS SUPERVISOR CHECKS A JOB
- UNDERSTANDING HOW SAS PROCESSES ERRORS
- DISTINGUISHING TYPES OF ERRORS. SAS RECOGNIZES FOUR KINDS OF ERRORS:
- SYNTAX ERRORS
- EXECUTION-TIME ERRORS
- DATA ERRORS
- SEMANTIC ERRORS
- DIAGNOSING ERRORS
- DIAGNOSING SYNTAX ERRORS
- DIAGNOSING DATA ERRORS
- USING A QUALITY CONTROL CHECKLIST

CHAPTER 16: ADVANCE TOPICS IN SAS

- PERFORMING ADVANCED QUERIES USING PROC SQL
- INTRODUCING MACRO VARIABLES
- CREATING AND USING MACRO PROGRAMS
- STORING MACRO PROGRAMS
- CREATING SAMPLES AND INDEXES
- USING LOOKUP TABLES TO MATCH DATA
- MODIFYING SAS DATA SETS AND TRACKING CHANGES
- INTRODUCTION TO EFFICIENT SAS PROGRAMMING