Dillard College of Business Administration

Syllabus: Independent Study in Economics – SAS Certification Preparation
ECON-6663-101 Fall Semester 2021
Tuesday-Thursday [TR] 11:00 am – 12:20 pm

CONTACT INFORMATION:

INSTRUCTOR:	**Dr. John E. Martinez**
OFFICE BLDG:	**Dillard College, Second Floor, Room 255**
OFFICE PHONE:	**(940) 397-4722**
E-MAIL:	john.martinez@msutexas.edu
OFFICE HOURS:	**9:30 am to 11:00 am Monday and Wednesday** **2:30 pm to 4:30 pm Monday and Wednesday,** **or by appointment.**

~~**ZOOM Link:**~~
~~**https://msutexas-edu.zoom.us/j/942 9983 6741**~~

SYLLABUS CHANGE POLICY:
This syllabus is a guide for the course and is subject to change. All changes will be announced in class and students will be responsible for incorporating the changes into the syllabus. If, at some point, the university switches to an online format, there will be significant changes in the way future exams are administered. In that case, it will be necessary for students to have access to a webcam. Any exam taken online will be monitored through RESPONDUS.

COURSE MATERIALS:
SAS® Certification Prep Guide [PG]: Base Programming for SAS®9, Third Edition
Copyright © 2011, SAS Institute Inc., Cary, NC, USA ISBN 978-1-60764-924-3

Learning SAS [LS] by Example – A Programmer's Guide, 2e, Ron Cody
Copyright © 2018, SAS Institute Inc., Cary, NC, USA ISBN 978-1-63526-659-7

Other Requirements: Access to SAS windowing environment.

COURSE DESCRIPTION:
The course is a test preparation document that uses the following environments and products:
- *SAS Certification Prep Guide [PG]: Base Programming for SAS®9*
- *Learning SAS [LS] by Example – A Programmer's Guide*

OBJECTIVES: To Prepare for Certification in SAS Base Programming for SAS ***®9***

LEARNING GOALS:
General Learning Goals:
Upon successful completion of this course, the student should have a fundamental understanding of SAS Base Programming

Course Specific Learning Goals:
Learn how to import data, create and modify SAS data sets
Learn how to identify and correct data syntax and programming logic errors.
Learn to Produce Descriptive Statistics and Create Reports
Learn to use Functions to Manipulate Data
Assessment:
Quizzes found in the Prep Guide will be used to assess attainment of learning goals.
Programs from Learning SAS

Information about SAS Certification
Taking SAS certification exams help you validate your skills and increase your value to an employer. You can choose SAS certifications across many subjects, including programming, data management, and analytics, to name a few. For more information on SAS certification go here: https://www.sas.com/en_us/certification.html.

All students, teachers, professors or staff associated with an academic institution qualify for **50% discount** on all SAS certification exams. Please contact certification@sas.com to receive the discount code that will reduce the exam fee by 50% during the registration process.

Resources for Learning SAS
SAS Certification Prep Guides: https://www.sas.com/store/books/categories/certification-guide/cBooks-cbooks_categories-cbooks_categories_12-p1.html

Visit SAS Communities Visit our online sites to share and connect with other SAS users and build your SAS skills. Don't miss key communities including: SAS Certification, SAS Training, SAS Academy for Data Science, SAS Programming, New SAS User, SAS Analytics U and SAS Viya for Learners. https://communities.sas.com/t5/Learn-SAS/ct-p/learn

COURSE POLICIES:

A. Attendance Policy:
Students are expected to attend all class meetings for this course.

B. Other Related Policies

GRADING and EVALUATIONS:
A student's grade are based on the following:

Grade Breakdown	*%*	*Points*
Individual Chapter Quizzes [PG] (Average Score – Chaps 1-16)	40%	400
Comprehensive Chapter Exams Exam I Chaps 01-08 [PG] Exam II Chaps 09-16 [PG]	20%	200
Chapter Programs Part II – Chaps 03-13 [LS] Part III – Chaps 14-20 [LS]	40%	400

GRADE EVALUATION:
Quizzes: The **SAS** Prep Guide [PG] has a multiple choice quiz at the end of each chapter. Students will take the individual Chapter quizzes online through D2L, with quizzes monitored through RESPONDUS. Each individual chapter quiz can be taken two times with each chapter quiz grade based on the top score. Students are responsible for taking all 16 quizzes.

Exams: Two online comprehensive exams, monitored through RESPONDUS, will be given throughout the semester. The first exam consists of a random sample of 50 MC questions from Chapters 1-8 of the Prep Guide; the second exam will consist of a random sample of 50 MC questions from Chapters 9-16 of the Prep Guide.
SAS Programs: Students are required to run all programs from Parts II and III from Learning SAS [LS].

Your grade will be determined as a percent of questions answered correctly: A (Above 90%), B (80-89), C (70-79), D (60-69), F (below 60).

Requirements and Details
Exam Objectives and Updates to This Book
The current exam objectives and a list of any updates to this book are available at www.sas.com/certify. Exam objectives are subject to change.
Registering for the Exam
It is the student's responsibility to register for the SAS Base Programming SAS®9 exam. See the SAS Global Certification website at www.sas.com/certify.

SAS PREP QUIDE [PG]

Contents

Chapter 1 • **Base *Programming*-**Chapter Quiz 37
Chapter 2 • ***Referencing Files and Setting Options*-**Chapter Quiz 72
Chapter 3 • ***Editing and Debugging SAS Program*-**Chapter Quiz 107
Chapter 4 • ***Creating List* Reports-**Chapter Quiz 145
Chapter 5 • ***Creating SAS Data Sets from External Flies*-**Chapter Quiz 193
Chapter 6 • ***Understanding DATA Step Processing*-**Chapter Quiz 230
Chapter 7 • ***Creating and Applying User-Defined Formats*-**Chapter Quiz 243
Chapter 8 • ***Producing Descriptive Statistics*-**Chapter Quiz 275
EXAM I

Chapter 9 • ***Producing HTML Output*-**Chapter Quiz 300
Chapter 10 • ***Creating* and *Managing Variables*-**Chapter Quiz 327
Chapter 11 • ***Reading SAS Data* Sets-**Chapter Quiz 355
Chapter 12 • ***Combining SAS Data Sets*-**Chapter Quiz 396
Chapter 13 • ***Transforming Data with SAS Functions*-**Chapter Quiz 459
Chapter 14 • ***Generating Data with DO Loops*-**Chapter Quiz 478
Chapter 15 • ***Processing Variables with* Arrays-**Chapter Quiz 510
Chapter 16 • ***Reading Raw Data in Fixed Fields*-**Chapter Quiz 530
EXAM II

Appendix I • ***Quiz Answer* Keys**
Chapter l: Base Programming 673
Chapter 2: Referencing Files and Using Options 677
Chapter 3: Editing and Debugging SAS Programs 680
Chapter 4: Creating List Reports 684
Chapter 5: Creating SAS Data Sets from External Files 689
Chapter 6: Understanding DATA Step Processing 695
Chapter 7: Creating and Applying User Defined Formats 698
Chapter 8: Producing Descriptive Statistics 701
Exam I

Chapter 9: Producing HTML Output 705
Chapter 10: Creating and Managing Variables 708
Chapter 11: Reading SAS Data Sets 714
Chapter 12: Combining SAS Datasets 717
Chapter 13: Transforming Data with SAS Functions 725
Chapter l4: Generating Data with DO Loops 728
Chapter 15: Processing Variables with Arrays 732

Chapter 16: Reading Raw Data in Fixed Fields 735

Exam II

List of Programs

PART II – DATA STEP PROCESSING

Programs in Chapter 3

3-1 Demonstrating list input with blanks as delimiters 31
3-2 Adding PROC PRINT to list the observations in the data set 31
3-3 Reading data from a comma-separated values (CSV) file 33
3-4 Using a FILENAME statement to identify an external file 34
3-5 Demonstrating the DATALINES statement 36
3-6 Using INFILE options with DATALINES 37
3-7 Demonstrating column input 38
3-8 Demonstrating formatted input 40
3-9 Demonstrating a FORMAT statement 42
3-10 Rerunning Program 3-9 with a different format 42
3-11 Using informats with list input 44
3-12 Supplying an INFORMAT statement with list input 45
3-13 Demonstrating the ampersand modifier for list input 46

Programs in Chapter 4

4-1 Creating a permanent SAS data set 55
4-2 Using PROC CONTENTS to examine the descriptor portion of a SAS data set 56
4-3 Demonstrating the VARNUM option of PROC CONTENTS 58
4-4 Using a LIBNAME in a new SAS session 58
4-5 Using PROC CONTENTS to list the names of all the SAS data sets in a SAS library 59
4-6 Using PROC PRINT to list the data portion of a SAS data set 63
4-7 Using observations from a SAS data set as input to a new SAS data set 66
4-8 Demonstrating a DATA _NULL_ step 67

Programs in Chapter 5

5-1 Adding labels to variables in a SAS data set 72
5-2 Using PROC FORMAT to create user-defined formats 74
5-3 Adding a FORMAT statement in PROC PRINT 75
5-4 Regrouping values using a format 77
5-5 Applying the new format to several variables with PROC FREQ 77
5-6 Creating a permanent format library 79
5-7 Adding LABEL and FORMAT statements in the DATA step 81
5-8 Running PROC CONTENTS on a data set with labels and formats 81
5-9 Using a user-defined format 82
5-10 Displaying format definitions in a user-created library 83
5-11 Demonstrating a SELECT statement with PROC FORMAT 84

Programs in Chapter 6

6-1 Using PROC PRINT to list the first four observations in a data set 91
6-2 Using the FIRSTOBS= and OBS= options together 92
6-3 Reading a spreadsheet using an XLS engine 96
6-4 Using ODS to convert a SAS data set into a CSV file (to be read by Excel) 97

Programs in Chapter 7

7-1 First attempt to group ages into age groups (incorrect) 102
7-2 Corrected program to group ages into age groups 104
7-3 An alternative to Program 7-2 105
7-4 Demonstrating a subsetting IF statement 106
7-5 Demonstrating a SELECT statement when a select-expression is missing 109
7-6 Combining various Boolean operators 110
7-7 A caution on the use of multiple OR operators 111
7-8 Using a WHERE statement to subset a SAS data set 112

Programs in Chapter 8

8-1 Example of a program that does not use a DO group 118
8-2 Demonstrating a DO group 119
8-3 Attempt to create a cumulative total 121
8-4 Adding a RETAIN statement to Program 8-3 122
8-5 Third attempt to create cumulative total 123
8-6 Using a sum statement to create a cumulative total 124
8-7 Using a sum statement to create a counter 124
8-8 Program without iterative loops 125
8-9 Demonstrating an iterative DO loop 126
8-10 Using an iterative DO loop to make a table of squares and square roots 127
8-11 Using an iterative DO loop to graph an equation 128
8-12 Using character values for DO loop index values 130
8-13 Demonstrating a DO UNTIL loop 131
8-14 Demonstrating that a DO UNTIL loop always executes at least once 133
8-15 Demonstrating a DO WHILE statement 133
8-16 Demonstrating that DO WHILE loops are evaluated at the top 134
8-17 Combining a DO UNTIL and iterative DO loop 135
8-18 Demonstrating the LEAVE statement 135
8-19 Demonstrating a CONTINUE statement 136

Programs in Chapter 9

9-1 Program to read dates from raw data 143
9-2 Adding a FORMAT statement to format each of the date values 144
9-3 Compute a person's age in years 146
9-4 Demonstrating a date constant 148
9-5 Using the TODAY function to return the current date 148
9-6 Extracting the day of the week, day of the month, month, and year from a SAS date 149
9-7 Using the MDY function to create a SAS date from month, day, and year values 150
9-8 Substituting the 15th of the month when a day value is missing 151
9-9 Demonstrating the INTCK function 154
9-10 Using the INTNX function to compute dates 6 months after discharge 156
9-11 Demonstrating the SAMEDAY alignment with the INTNX function 156

Programs in Chapter 10

10-1 Subsetting a SAS data set using a WHERE statement 162
10-2 Demonstrating a DROP= data set option 163
10-3 Creating two data sets in one DATA step 164
10-4 Using a SET statement to combine observations from two data sets 165
10-5 Using a SET statement on two data sets containing different variables 166
10-6 Interleaving data sets 167
10-7 Combining detail and summary data: using a conditional SET statement 168
10-8 Merging two SAS data sets 171
10-9 Demonstrating the IN= data set option 173
10-10 Using IN= variables to select IDs that are in both data sets 174
10-11 More examples of using IN= variables 175
10-12 Demonstrating when a DATA step ends 176
10-13 Merging two data sets by renaming a variable in one data set 178
10-14 Merging two data sets when the BY variables are different data types 179
10-15 An alternative to Program 10-14 180
10-16 Updating a master file from a transaction file 184

Programs in Chapter 11

11-1 Demonstrating the ROUND and INT truncation functions 191
11-2 Testing for missing numeric and character values (without the MISSING function) 192
11-3 Demonstrating the MISSING function 192
11-4 Demonstrating the N, MEAN, MIN, and MAX functions 194
11-5 Finding the sum of the three largest values in a list of variables 195
11-6 Using the SUM function to compute totals 197
11-7 Demonstrating the ABS, SQRT, EXP, and LOG functions 197
11-8 Computing some useful constants with the CONSTANT function 198
11-9 Using the RANUNI function to randomly select observations 200
11-10 Using PROC SURVEYSELECT to obtain a random sample 200
11-11 Using the INPUT function to perform a character-to-numeric conversion 202
11-12 Demonstrating the PUT function 203
11-13 Demonstrating the LAG and LAGn functions 204
11-14 Demonstrating what happens when you execute a LAG function conditionally 205
11-15 Using the LAG function to compute interobservation differences 206
11-16 Demonstrating the DIF function 207

Programs in Chapter 12

12-1 Determining the length of a character value 213

12-2 Changing values to uppercase 214
12-3 Converting multiple blanks to a single blank and demonstrating the PROPCASE function 215
12-4 Demonstrating the concatenation functions 216
12-5 Demonstrating the TRIM, LEFT, and STRIP functions 217
12-6 Using the COMPRESS function to remove characters from a string 219
12-7 Demonstrating the COMPRESS modifiers 220
12-8 Demonstrating the FIND and COMPRESS functions 221
12-9 Demonstrating the FINDW function 224
12-10 Demonstrating the ANYDIGIT function
12-11 Demonstrating the NOT functions for data cleaning 227
12-12 Using the VERIFY function for data cleaning 228
12-13 Using the SUBSTR function to extract substrings 229
12-14 Demonstrating the SCAN function 230
12-15 Using the SCAN function to extract the last name 231
12-16 Demonstrating the COMPARE function 232
12-17 Clarifying the use of the colon modifier with the COMPARE function 233
12-18 Using the SPEDIS function to perform a fuzzy match 234
12-19 Demonstrating the TRANSLATE function 236
12-20 Using the TRANWRD function to standardize an address 237

Programs in Chapter 13

13-1 Converting values of 999 to a SAS missing value—without using arrays 244
13-2 Converting values of 999 to a SAS missing value—using arrays 245
13-3 Rewriting Program 13-2 using the CALL MISSING routine 246
13-4 Converting values of NA and ? to missing character values 247
13-5 Converting all character values in a SAS data set to lowercase 249
13-6 Using an array to create new variables 250
13-7 Changing the array bounds 251
13-8 Using a temporary array to score a test 252
13-9 Loading the initial values of a temporary array from a raw data file 253
13-10 Loading a two-dimensional, temporary array with data values 255

PART III – PRESENTING AND SUMMARIZING YOUR DATA

Programs in Chapter 14

14-1 PROC PRINT using all the defaults 262
14-2 Controlling which variables appear in the listing 264
14-3 Using an ID statement to omit the Obs column 264
14-4 Adding a FORMAT statement to PROC PRINT 266
14-5 Controlling which observations appear in the listing (WHERE statement) 267
14-6 Using the IN operator in a WHERE statement 267
14-7 Adding titles and footnotes to your listing 268
14-8 Using PROC SORT to change the order of your observations 270
14-9 Demonstrating the DESCENDING option of PROC SORT 271
14-10 Sorting by more than one variable 272
14-11 Using labels as column headings with PROC PRINT 273
14-12 Using a BY statement in PROC PRINT 275
14-13 Adding totals and subtotals to your listing 276
14-14 Using an ID statement and a BY statement in PROC PRINT 278
14-15 Demonstrating the N= option with PROC PRINT 279
14-16 Double-spacing your listing 280
14-17 Listing the first five observations of your data set 281
14-18 Forcing variable labels to print horizontally 282

Programs in Chapter 15

15-1 Listing of Medical using PROC PRINT 288
15-2 Using PROC REPORT (all defaults) 289
15-3 Adding a COLUMN statement to PROC REPORT 291
15-4 Using PROC REPORT with only numeric variables 292
15-5 Using DEFINE statements to define a display usage 292
15-6 Specifying a GROUP usage to create a summary report 293
15-7 Demonstrating the FLOW option with PROC REPORT 294
15-8 Explicitly defining usage for every variable 296
15-9 Demonstrating the effect of two variables with GROUP usage 296
15-10 Reversing the order of variables in the COLUMN statement 298
15-11 Demonstrating the ORDER usage of PROC REPORT 299
15-12 Applying the ORDER usage for two variables 300
15-13 Creating a multi-column report 302
15-14 Requesting a report break (RBREAK statement) 303
15-15 Demonstrating the BREAK statement of PROC REPORT 304
15-16 Using a nonprinting variable to order the rows of a report 306
15-17 Computing a new variable with PROC REPORT 307
15-18 Demonstrating an ACROSS usage in PROC REPORT 310

Programs in Chapter 16

16-1 PROC MEANS with all the defaults 320
16-2 Adding a VAR statement and requesting specific statistics with PROC MEANS 322
16-3 Adding a BY statement to PROC MEANS 323
16-4 Using a CLASS statement with PROC MEANS 324
16-5 Demonstrating the effect of a formatted CLASS variable 326
16-6 Creating a summary data set using PROC MEANS 327
16-7 Outputting more than one statistic with PROC MEANS 329
16-8 Demonstrating the OUTPUT option AUTONAME 330
16-9 Adding a BY statement to PROC MEANS 331
16-10 Adding a CLASS statement to PROC MEANS 332
16-11 Adding the NWAY option to PROC MEANS 332
16-12 Using two CLASS variables with PROC MEANS 333
16-13 Adding the CHARTYPE procedure option to PROC MEANS 334
16-14 Using the _TYPE_ variable to select cell means 336
16-15 Using a DATA step to create separate summary data sets 336
16-16 Selecting different statistics for each variable using PROC MEANS 337

Programs in Chapter 17

17-1 Counting frequencies: one-way tables using PROC FREQ 342
17-2 Adding a TABLES statement to PROC FREQ 345
17-3 Adding formats to Program 17-2 346
17-4 Using formats to group values 348
17-5 Demonstrating a problem in how PROC FREQ groups values 349
17-6 Fixing the grouping problem 350
17-7 Demonstrating the effect of the MISSING option of PROC FREQ 351
17-8 Demonstrating the ORDER= option of PROC FREQ 353
17-9 Demonstrating the ORDER= formatted, data, and freq options 354
17-10 Requesting a two-way table 356
17-11 Requesting a three-way table with PROC FREQ 359

Programs in Chapter 18

18-1 PROC TABULATE with all the defaults and a single CLASS variable 365
18-2 Demonstrating concatenation with PROC TABULATE 366
18-3 Demonstrating table dimensions with PROC TABULATE 367
18-4 Demonstrating the nesting operator with PROC TABULATE 368
18-5 Adding the keyword ALL to your table request 369
18-6 Using PROC TABULATE to produce descriptive statistics 370
18-7 Specifying statistics on an analysis variable with PROC TABULATE 371
18-8 Specifying more than one descriptive statistic with PROC TABULATE 371
18-9 Combining CLASS and analysis variables in a table 372
18-10 Associating a different format with each variable in a table 374
18-11 Renaming keywords with PROC TABULATE 375
18-12 Eliminating the N column in a PROC TABULATE table 376
18-13 Demonstrating a more complex table 377
18-14 Computing percentages in a one-dimensional table 379
18-15 Improving the appearance of output from Program 18-14 380
18-16 Counts and percentages in a two-dimensional table 381
18-17 Using COLPCTN to compute column percentages 383
18-18 Computing percentages on a numeric value 384
18-19 Demonstrating the effect of missing values on CLASS variables 386
18-20 Missing values on a CLASS variable that is not used in the table 387
18-21 Adding the PROC TABULATE procedure option MISSING 388
18-22 Demonstrating the MISSTEXT= TABLES option 389

Programs in Chapter 19

19-1 Sending SAS output to an HTML file 398
19-2 Creating a table of contents for HTML output 400
19-3 Choosing a style for HTML output 401
19-4 Using an ODS SELECT statement to restrict PROC UNIVARIATE output 404
19-5 Using the ODS TRACE statement to identify output objects 404
19-6 Using ODS to send procedure output to a SAS data set 407
19-7 Using an output data set to create a simplified report 409

Programs in Chapter 20

20-1 Producing a simple bar chart using PROC GCHART 414
20-2 Creating a simple pie chart 415
20-3 Creating a bar chart for a continuous variable 416
20-4 Selecting your own midpoints for the chart 417
20-5 Demonstrating the need for the DISCRETE option of PROC GCHART 419
20-6 Demonstrating the DISCRETE option of PROC GCHART 420
20-7 Creating a bar chart where the height of the bars represents sums 421
20-8 Creating a bar chart where the height of the bars represents means 422
20-9 Adding another variable to the chart 423
20-10 Demonstrating the SUBGROUP= option 424
20-11 Creating a simple scatter plot using all the defaults 425
20-12 Changing the plotting symbol and controlling the axis ranges 426
20-13 Joining the points with straight lines (first attempt) 427
20-14 Using the JOIN option on a sorted data set 429
20-15 Drawing a smooth line through your data points 430