Tufts University, Friedman School of Nutrition Science and Policy

NUTR 237 – Introduction to SAS Programming
Fall 2021

Synchronous
Online instruction: Tuesdays and Thursdays 1:30-3:00 p.m.
Starting Thursday, September 9th 2021

Synchronous
Online help: TBD based on class input

Instructor(s): Gail Rogers: Gail.Rogers@Tufts.edu (she/her/hers)
Office hours: by appointment, Tues and Wed (in person) or online. Office location is USDA-HNRCA, 711 Washington St, Boston MA
11th floor, Room # 1122
Phone: 617 556 3338

Teaching Asst.: TBD based on class size

Graduate Credits: 0.5 credit
Prerequisites: None

Course Description: This half-semester course will provide students with sufficient knowledge of how to obtain, manage, and prepare data in SAS for Windows. Emphasis will be placed on the basics of SAS programming and data manipulation. Upon completion, students should be able to use data in SAS and be familiar with the procedure steps required to import and export data, create SAS data sets, produce descriptive statistics, provide graphical displays, and transform data in preparation for statistical analyses. In-class exercises and weekly homework assignments will allow students to acquire hands-on experience solving common SAS programming tasks.

Course Objectives: Upon completion, students should be able to:
1) Use SAS data and procedure steps to import and export data
2) Create, modify and save SAS data sets
3) Merge and append data
4) Use SAS functions and statements to summarize and define new variables
5) Produce descriptive statistics and graphical displays
6) Transform data in preparation for statistical analyses
This semester we will be utilizing SAS on the TTS Remote Lab for synchronous instruction. Students will need to download and install the VMWare Horizon Client (Windows and Mac versions) to access the Remote Lab prior to the first class.

The remote lab will be titled "TTS Remote Lab (Adobe)" and has SAS installed on it, and automatically mount the S drive.

TTS has recorded a video walkthrough of how to access this resource here: https://tufts.box.com/s/jk4geadrhdh4hylbk02q1zxtrfpwbpe

Detailed instructions from TTS are available here:

https://tufts.box.com/v/TTSRemoteLab-Windows
https://tufts.box.com/v/TTSRemoteLab-Mac

Even if a student has SAS on their personal PC, they should install the Remote Lab for the synchronous portion of the class. For those on who want to additionally install SAS on their personal computer, SAS software version 9.3 or higher is required. Tufts has a site license with SAS and students may install a copy on their laptop. Please see https://access.tufts.edu/sas to get more information on downloading and installing the software. A typical installation can take up to an hour or more so please have your AC cord connected. Alternatively, students may also find SAS installed on the computers on the fifth floor of the HHSL library and PHPD student lounge. Please note that SAS may not work equally well on all operation systems, check for the compatibility at: http://support.sas.com/supportos/list.

Diversity statement
I believe that the diversity of student experience and perspective is essential to the deepening of knowledge in this course. I consider it part of my responsibility as an instructor to address the learning needs of all the students in this course. I will present material that are respectful of diversity: race, color, ethnicity, gender, age, disability,
religious beliefs, political preference, sexual orientation, gender identity, socioeconomic status, citizenship, language, or national origin among other personal characteristics.

Accommodation of Disabilities:
While I intend to present material in a way that is inclusive and accessible, I realize this might not address all necessary accommodations needed by student with disabilities. Students with documented disabilities are entitled to academic accommodation appropriate to their needs. If you require accommodations for this course, please contact me confidentially prior to the end of the second week of classes.

Academic Conduct: Each student is responsible for upholding the highest standards of academic integrity, as specified in the Friedman School’s Policies and Procedures handbook (http://nutrition.tufts.edu/student/documents) and Tufts University policies (http://uss.tufts.edu/studentaffairs/judicialaffairs/AcademicIntegrity.pdf). It is the responsibility of each student to understand and comply with these standards, as violations will be sanctioned by penalties ranging from failure on an assignment and the course to dismissal from the school.

Classroom Conduct: Students must notify the instructor in advance if you will be absent for the class. Also, inform the instructor in charge if you decide to leave the class early. Students who miss the class are responsible for downloading and reviewing the lecture materials and submitting exercises from the class.

Assessment and Grading: Five homework assignments (weekly) 50%
In-class programming exercises (ungraded) 5%
Comprehensive final exam 45%

<table>
<thead>
<tr>
<th>Grading Scale</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>94-100</td>
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<tr>
<td>A-</td>
<td>90-93</td>
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<tr>
<td>B+</td>
<td>87-89</td>
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<td>B</td>
<td>84-86</td>
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<tr>
<td>B-</td>
<td>80-83</td>
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<tr>
<td>C+</td>
<td>77-79</td>
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<tr>
<td>C</td>
<td>73-76</td>
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<tr>
<td>C-</td>
<td>70-72</td>
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<td>D+</td>
<td>67-69</td>
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<td>D</td>
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<td>F</td>
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Assignments and Submission Instructions:

Homework is due at the assigned deadline. Homework assignments shall be submitted to the instructor via CANVAS along with corresponding SAS code, logs, and...
output prior to the deadline. Assignments received after their deadline will not be accepted or graded unless an extension is approved in advance. Students who are unable to complete an assignment or exam on time for any reason should notify the instructor by email prior to the deadline, with a brief explanation for why the extension is needed. Please submit all files to CANVAS using the following file naming convention: HMK#_LastName_First initial_YYYMMDD.sas (or *.log, *.mht, etc.). For example, the first homework I would submit would include: HMK1_Rogers_G_20210915.sas
HMK1_Rogers_G_20210915.log
HMK1_Rogers_G_20210915.mht

Lab exercises should be submitted to the class BOX folder at the end of each class. This submission will count as your attendance for the class and will not be graded. Only the *.sas program needs to be submitted and should follow the naming convention of LAB#_LastName_First Initial_YYYMMDD.sas

Course Schedule:
* This schedule is subject to modification at the instructor’s discretion.

<table>
<thead>
<tr>
<th>Class #</th>
<th>Topic</th>
<th>Assignments Due</th>
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<tbody>
<tr>
<td>1. (9/9)</td>
<td>Getting started with SAS</td>
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<tr>
<td>2. (9/14)</td>
<td>Getting your data into SAS 1</td>
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<tr>
<td>3. (9/16)</td>
<td>Getting your data into SAS 2</td>
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<tr>
<td>4. (9/21)</td>
<td>Working with your data 1</td>
<td>Assignment #1</td>
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<td>5. (9/23)</td>
<td>Working with your data 2</td>
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<tr>
<td>6. (9/28)</td>
<td>Modifying and combining SAS data sets 1</td>
<td>Assignment #2</td>
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<tr>
<td>7. (9/30)</td>
<td>Modifying and combining SAS data sets 2</td>
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<tr>
<td>8. (10/5)</td>
<td>Transposing SAS data sets</td>
<td>Assignment #3</td>
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<td>9. (10/7)</td>
<td>Working with Longitudinal data</td>
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<tr>
<td>10. (10/12)</td>
<td>Visualizing data with ODS graphs</td>
<td>Assignment #4</td>
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<td>11. (10/14)</td>
<td>Using basic statistical procedures</td>
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<td>12. (10/19)</td>
<td>Using the Output Delivery System</td>
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<tr>
<td>13. (10/21)</td>
<td>Macros/Review</td>
<td>Assignment #5</td>
</tr>
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(TBD) Take home final assigned
Course Topics, Learning Objectives and Assignments

* This schedule is subject to modification at the instructor’s discretion.

Class # 1: (9/9) 
*Getting started with SAS, Gail Rogers*

**Learning objectives:**
Upon completion of this week, students will be able to:
1) Open and run a basic SAS program
2) Properly document SAS programs
3) Understand the basic functions and options of the editor, log, output and results viewer windows
4) Use the contents procedure and basic print statements to explore data
5) Use SAS and other documented internet resources to find syntax help

**Preparation for class:**
*Chapter 1 of The Little SAS Book*

**Assignments for this class:**
*None*

Class # 2: (9/14) 
*Getting your data into SAS 1, Gail Rogers*

**Learning objectives:**
Upon completion of this week, students will be able to:
1) Enter data into SAS using viewtable and datalines
2) Open SAS, SPSS, files using libname, filename and engine statements
2) Use SAS data step and input statements to read in complex *.txt and *.CSV files using List input

**Preparation for class:**
*Chapter 2 of The Little SAS Book*

**Assignments for this class:**
*Assignment # 1 given*
Class # 3: (9/16) *Getting your data into SAS II, Gail Rogers*

**Learning objectives:**
Upon completion of this week, students will be able to:
1) Open SAS, SPSS, and EXCEL files using libname, filename and engine statements
2) Use SAS procedures to import *.txt, *.csv, Excel and other external data
3) Use SAS data step and input statements to read in complex *.txt files

**Preparation for class:**
Continue reading *Chapter 2 of The Little SAS Book*

**Assignments for this class:**
*Continue assignment # 1*

Class # 4: (9/21) *Working with your Data Part 1, Gail Rogers*

**Learning objectives:**
Upon completion of this class, students will be able to:
1) Create and redefine variables
2) Use selected SAS numeric and character functions
3) Use If -then statements
4) Use simple do loops for iterative processing
5) Subset data

**Preparation for class:**
*Chapter 3 of The Little SAS Book*

**Assignments for this class:**
*Assignment # 1 is due*
*Assignment # 2 is given*

Class # 5: (9/23) *Working with Your Data Part 2, Gail Rogers, Sackler 510*

**Learning objectives:**
Upon completion of this week, students will be able to:
1) Create labels and formats
2) Convert data from character to numeric and numeric to character
3) Use SAS date functions
4) Use simple arrays
Preparation for class:
   *Continue reading chapter 3 of The Little SAS Book*

Assignments for this class:
   *Continue assignment # 2*

Class # 6: (9/28) *Modifying and Combining SAS data sets 1, Gail Rogers, Sackler 510*

Learning objectives:
   Upon completion of this week, students will be able to:
   1) Create multiple data sets from one file
   2) Append SAS data sets
   3) Use data set options in concatenating files

Preparation for class:
   *Chapter 6 of The Little SAS Book*

Assignments for this class:
   *Assignment # 2 is due*
   *Assignment # 3 is given*

Class # 7: (9/30) *Modifying and Combining SAS data sets 2, Gail Rogers*

Learning objectives:
   Upon completion of this class, students will be able to:
   2) Merge SAS data sets (1:1, inner and outer joins)
   3) Use the IN= operator to track and control observations
   4) Merge files using multiple variables
   5) Use data set options in merging files

Preparation for class:
   Continue reading *Chapter 6 of The Little SAS Book*

Assignments for this class:
   *Continue Assignment # 3*
Class # 8: (10/5) Transposing data, Gail Rogers

Learning objectives:
Upon completion of this week, students will be able to:
1) Use the transpose procedure to convert data from long to wide and wide to long
2) Use data step procedure to aggregate, separate and reshape data in preparation for data analysis

Preparation for class:
Continue reading Chapter 6 of The Little SAS Book.

Assignments for this class:
Assignment # 3 is due
Assignment # 4 is given

Class # 9: (10/7) Working with Longitudinal data, Gail Rogers

Learning objectives:
Upon completion of this week, students will be able to:
1) Use shortcuts for variable naming
2) Identify first and last observations in a group
3) Use the Retain and Sum statements
4) Count the number of observations per by group
5) Calculate across observations

Preparation for class:
Intro to Longitudinal Data: A Grad Student “How-To” Paper (on trunk)

Assignments for this class:
Continue Assignment # 4

Class # 10: (10/12) Visualizing data with ODS graphs, Gail Rogers

Learning objectives:
Upon completion of this week, students will be able to:
1) Use and understand the basics of Output Delivery System (ODS Graphics
2) Create scatterplots, box plots, histograms and series plots in SAS
3) Customize and save graphics output for use in other software packages
Preparation for class:
Chapter 8 of The Little SAS Book

Assignments for this class:
Assignment # 4 is due
Assignment # 5 is given

Class # 11: (10/14) Basic Statistical Procedures, Gail Rogers

Learning objectives:
Upon completion of this week, students will be able to:
1) Use the frequency, univariate, means and correlation procedures
2) Do simple statistical tests using the T-test, ANOVA and Regression procedures
3) Understand the output from the above procedures and how to customize output and save results in data steps as well as *.html, and *.rtf files

Preparation for class:
Chapter 9 of The Little SAS Book

Assignments for this class:
Continue Assignment # 5

Class # 12: (10/19) Using the Output Delivery System, Gail Rogers

Learning objectives:
Upon completion of this week, students will be able to:
1) Understand the basics of ODS
2) Work with table and style templates
3) Trace and select output tables
4) Create files for various destinations including: SAS data set, *.PDF, *.RTF and *.HTML

Preparation for class:
Chapter 5 of The Little SAS Book

Assignments for this week:
Continue assignment # 5
Class # 13: (10/21) *Macros & Review, Sackler 510*

**Preparation for class:**

*None*

**Assignments for this week:**

*Assignment # 5 is due*