August 16, 2019

The George Washington University
Department of Statistics
SAS PROGRAMMING - STAT 6197 (Section 10 CRN 94952)
Course Syllabus (Fall 2019)

Class hours and location: Fridays 3:30-6:00 PM; ROME B104
Instructor: Pradip K. Muhuri, PhD (muhuri@gwu.edu)
Office hours and location: Fridays 6:00-7:00 PM; ROME B104

Course Description:

This is a one-semester course designed to introduce students to SAS programming for accessing and managing data, transforming and manipulating data, controlling, modifying, aggregating, combining and reshaping SAS data sets, exploring and summarizing data, and generating reports. The course will cover the SAS macro facility, and key aspects of both the Structured Query Language (SQL) and the Interactive Matrix Language (IML). The course will use the SASPy module (a Python interface to the SAS System) in Jupyter Notebook for applications that will use object-oriented methods and magic commands from the Python language and generate SAS code from Python scripts.

Course Prerequisites:

This course is intended for students who have taken a course in programming and intend to develop an appreciation for the inner workings of SAS. Formal prerequisites for the course are an introductory course in statistics (e.g., STAT 1051 or 1053), prior knowledge of programming or permission of the instructor. Familiarity with SAS is desired but not required; however, students cannot receive credit for both STAT 4197 and STAT 6197.

Learning Outcomes:

After completing the course, students will be able to:
- read raw data and Microsoft Excel files into SAS
- transform data and create new variables with an expression, by recoding data values
- manipulate data using SAS functions, arrays, and Do loops, etc.
- aggregate, combine, and reshape SAS data sets
- explore and summarize data, and generate reports
- perform queries and join tables using the SQL procedure
- automate and customize the generating of SAS code using the macro facility
- write data driven dynamic programs using the SAS macro facility
- manipulate matrices and SAS data sets using PROC IML
- start a SAS session and run analytics from Python
- identify and correct common errors in SAS programs
- navigate through electronic resources from the SAS system for writing SAS programs

Textbooks and Other Resources:

Delwiche L, and Slaughter S. *The Little SAS Book: A Primer*, Fifth Edition Paperback – November 7, 2012 (Recommended)

Ottesen RA, Delwiche LD, and Slaughter SJ. *Exercises and Projects for The Little SAS Book*, Fifth Edition Paperback – July 1, 2015 (Recommended)

Cody, R. *Cody's Data Cleaning Techniques Using SAS®*, Third Edition - March 2017 (Recommended)

SAS® 9.4 Language Reference: Concept, Sixth Edition (Here is the link.)

Base SAS® 9.4 Procedures Guide, Seventh Edition (Here is the link.)

SAS® 9.4 SQL Procedure User's Guide Fourth Edition (Here is the link.)

SAS® 9.4 Macro Language: Reference Fifth Edition (Here is the link.)

SAS/IML 14.3 User's Guide (Here is the link.)

SASPy (Here is the link.)

Schedule of Lectures and Assessments:

Week	Date	Major Lecture Topics	Assessments
1	08/30/2019	The SAS System: Concepts and Components	
2	09/06/2019	DATA Step: Reading Data and Creating Reports	Take-Home Assignment 1 Given
3	09/13/2019	Working with Formats/Informats and Transforming Data	
4	09/20/2019	Functions, Data Conversions, Do Loops, and Arrays	Quiz 1
5	09/27/2019	Controlling and Managing SAS Data Sets	
6	10/04/2019	Aggregating Data, and Combining SAS Data Sets (DATA Step vs. PROC SQL)	Take-Home Assignment 2 Given
7	10/11/2019	Exploring and Summarizing Data, and Generating Reports (Base SAS PROC Steps and ODS)	Quiz 2
8	10/18/2019		Midterm Exam
9	10/25/2019	SAS Macro Language Basics	Take-Home Assignment 1 Due
10	11/01/2019	Macro Functions and Working with Macros	
11	11/08/2019	Additional Topics on the DATA Step and the Macro Facility	Quiz 3
12	11/15/2019	Matrix Operations and Functions in SAS/IML	Quiz 4/In-class Assignment, and Take-Home Assignment 2 Due

Week	Date	Major Lecture Topics	Assessments
13	11/22/2019	Simulating Data with SAS and Calling R in a SAS/IML Session	Quiz 5/In-class Assignment (Optional)
14	Thanksgiving Break (no class on 11/29/2019)		
15	12/06/2019	Applications of the SASPy Module (a Python Interface to the SAS System) in Jupyter Notebook	
	12/13/2019 (Tentative date)		Final Exam

Assessments:

For this course, there will be four quizzes/in-class assignments, two take-home assignments and two exams – a total of eight assessments. In addition, there will be an optional additional quiz/in-class assignment, which students can take and drop the lowest score in quizzes and in-class assignments. For each assessment, scores will be reported in points. To compute weighted average points with percentages, the following assessment category-specific weights will be used:

Four quizzes/in-class assignments (100 points each)	20%
Take-home assignment 1 (100 points)	10%
Take-home assignment 2 (100 points)	10%
Midterm exam (100 points)	30%
Final exam (100 points)	30%
Total	**100%**

Students should not assume that their overall weighted average points will be curved in the determination of their final grades. If the instructor decides to grade on a curve for this course, the choice for the curving methods is entirely at his discretion.

The final letter grades for the course will be reported based on the following numerical ranges of weighted average points with percentages: A = 94-100%, A- = 90-93%, B+ = 87-89%, B = 83-86%, B- = 80-82%, C+ = 77-79%, C = 73-76%, C- = 70-72%, D+ = 67-69%, D = 63-66%, D- = 60-62% and F <60%. However, the instructor will have the discretion to make changes to the above cutoffs. Students showing hard work inside and outside of classroom and exemplary participation in class may be given some positive consideration in determining the final course grades. Students must agree to the above methods of assigning the final course grades. All grades are non-negotiable!

Course Policies:

- Lecture handouts will contain SAS' copyrighted course materials, which the instructor received by signing an agreement with SAS® Institute. They will be posted to Blackboard. Reproducing the materials by students is prohibited by law.
- Example code and materials that illustrate SAS language concepts and applications will be in private GitHub repositories, and students will be given read-only access to them.
- Homework assignments submitted after the deadlines will not be accepted for grading.
- There will be no make-up exams/tests or extra-credit assignments.
- Incomplete: A grade of incomplete may only be given to students who are passing the course and cannot complete the course due to well documented circumstances beyond their control. Here is the link for details.
- There will be absolutely no tolerance of academic dishonesty with their assignments and during tests/ exams. Severe measures will be taken against academic dishonesty. All

students must be familiar with and abide by the provisions of the "Code of Academic Integrity". Here is the link for details.

- Students must turn off their mobile devices and store them out of reach during class sessions and exams.
- The instructor's response to students' e-mails may take more than 24 hours.

Average Minimum Amount of Out-of-class or Independent Learning Expected Per Week:

In a 15-week semester (14 weeks of instruction time plus a 15th week reserved for the final exam), students are expected to spend 2.5 hours of direct instruction and a minimum of 5 hours of independent learning (outside of class) – a total of 7.5 hours per week. Here is the link for details.

University Policy on Observance of Religious Holidays:

In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. Here is the link for details.

Accommodations for Students with Disabilities:

Disability Support Services (DSS): Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. Here is the link for details.

Mental Health Services 202-994-5300:

The University's Mental Health Services offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations confidential assessment, counseling services (individual and small group), and referrals. Here is the link for details.

Academic Integrity Code:

Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information. Here is the link for details.

Security and Safety Policy:

In the case of an emergency, if possible, the class should shelter in place. If the building that the class is in is affected, students should follow the evacuation procedures for the building. After evacuation, they should seek shelter at a predetermined rendezvous location.

Obtaining SAS Software:

Base SAS® software, which uses the SAS windowing environment, is already installed in computer Lab workstations, and students will have complete access to these workstations in classroom (Rome Hall, Room B104). The SAS License is available from the Instructional Technology Lab (ITL) free of charge to GWU students who have registered for this course. Here is the link for the

form, which students are required to complete online, in order to request a link to download the SAS Software or a license update to their already installed SAS software.

Besides the licensed version of Base SAS® software from ITL, a free version of the software called SAS® University Edition is available for downloads from the web. Students are required to install SAS® University Edition in their own laptops. Here is the link for instructions on how to download and install SAS(R) University Edition. Here is an additional link for students to check out before downloading and installing SAS(R) University Edition. Students will be using SAS® University Edition in Jupyter Notebook for completing their homework and in-class assignments.