Prof.: Pradip K. Muhuri
Office: Rome Hall, Room 205
E-Mail: muhuri@gwu.edu
Office Hours: Wednesday 6:00-7:00 pm
Class Time and Location: Wednesday 3:30-6:00 pm, Rome Hall, Room 205

Course Description:
This is a one semester course designed to introduce students to the fundamentals of the SAS system for data management, statistical analysis and report writing. Students learn how to use SAS as a programming language for data modification, file handling, matrix manipulation and macro writing. The first part of the course is devoted data step programming and provides an overview of the language, its capabilities and weaknesses. The second part will concentrate on the Interactive Matrix Language (IML). The third part of the course focuses on the components of the SAS Macro Programming as time permits.

This course is intended for students who have taken a course in programming and would like to develop an appreciation for the inner workings of SAS. Formal prerequisite for the course is an introductory course in programming (STAT 129) and an introductory course in statistics (STAT 51 or 53) or permission of instructor.

Learning Objectives:
1. Write SAS data step programs
2. Write SAS IML programs
3. Write SAS Macro programs

Textbooks:
1. The Little SAS Book (by Delwiche and Slaughter, SAS Institute)
2. Step-By-Step Programming with Base SAS Software (Available on Blackboard)
3. SAS IML Software: Usage and Reference (Available on Blackboard)

Grade:
1. 25% Midterm Exam
2. 25% Final Exam
3. 50% Programming Projects
Topics:

A. SAS Programming

1. Basic Concepts and Essentials: What is SAS? Base SAS System and Basic Functionality; Data Step Basics; Defining Components of a SAS Program; SAS Program Syntax; Navigating the SAS® Windowing Environment and SAS Windows; SAS Function Keys; Demonstration of Submitting SAS Programs; and Diagnosing and Correcting Syntax Errors

2. Getting Data into SAS: Identifying the Location of the Data File; Understanding the Data Structure; Reading Text Data Files (Data Delimited by Characters, Spaces or Tabs and Data Aligned in Columns); Reading Spreadsheet Data; Using Different Input Styles for Numeric, Character, and Non-Standard Variables; Reading Multiple Lines of Raw Data per Observation; Reading Multiple Observations per Line of Raw Data; Controlling the INPUT Statement with Options in the INFILE Statement; Creating Temporary and Permanent Data Sets; and Listing the Contents of a SAS Data Set

3. Summarizing the Data and Creating List Reports: Summarizing the Data Using Analytic Procedures (e.g., PROC FREQ, PROC MEANS, PROC UNIVARIATE, and PROC TABULATE) and Using Utility Procedures (e.g., PROC FORMAT); Producing Reports Using Different Reporting Procedures (e.g., PROC PRINT, and PROC PRINTTO); Enhancing Output with ODS; and Producing Customized Reports Using the DATA _NULL_ Step

4. Working with Data: Manipulating Data; Conditional Processing; Grouping Observations; Subsetting Data; Working with SAS Dates, and SAS Functions; Converting Data Values from Numeric to Character and Vice Versa; Simplifying Programs with Arrays; and One, Two and Multidimensional Arrays

5. Modifying and Combining SAS Data Sets: Stacking, Interleaving SAS Data Sets; Combining Data Sets Using a One-to-One Match Merge; Combining Data Sets Using a One-to-Many Match Merge; Creating Rectangular Files from Hierarchical Files, and Vice Versa; Updating a Master Data Set with Transactions; Selecting Observations by Observation Numbers with Options in the SET Statement; Selecting and Renaming Variables with Options in the SET Statement; Accessing Observations Randomly; and Iterative Processing

6. Additional Topics: Common SAS Programming Mistakes; and Efficiency

B. SAS/IML Programming

1. Basics: Matrices in SAS/IML Software; and Language Overview

2. Using SAS Data Sets with SAS/IML Software: Reading Observations from SAS Data Sets; Creating Data Sets from Matrices; Processing Data Sets in SAS/IML Software; and Editing SAS Data Sets with PROC IML

3. Application Development: Loops, Conditions, and Modules

4. Additional Topics: Storage Features, Memory and Workspace; and IML Module Library
C. SAS Macro Programming
1. Macro Language Basics: Macro Facility and Program Flow
2. Macro Variables: Introduction to Macro Variables; Automatic Macro Variables; User-Defined Macro Variables; Macro Quoting Functions; Delimiting Macro Variable References; and Macro Functions; and Nested Macros
3. Macro Definitions: Defining and Calling Macro (Positional, Keyword, and Mixed Parameters)
4. Data Step Interface: SYMPUT Routine, and SYMGET Function; Referencing Macro Variables Indirectly
5. Macro Programs: Conditional Processing; Parameter Validation; Iterative Processing; and Symbol Tables Rules (Global and Local Variables)

ACADEMIC INTEGRITY: I personally support the GWU Code of Academic Integrity. Academic dishonesty means 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. For the remainder of the code, see: http://www.gwu.edu/integrity/code.html

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 Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: http://gwired.gwu.edu/dss/

UNIVERSITY COUNSELING CENTER (UCC) 202-994-5300: The University Counseling Center (UCC) 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 (http://gwired.gwu.edu/counsel/CounselingServices/AcademicSupportServices).
SECURITY: In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.