COURSE SYLLABUS

Instructor: Pradip K. Muhuri, PhD (muhuri@gwu.edu)
Class Hours and Classroom: Fridays 3:30-6:00 PM; ROME B104
Office Hours and Location: Fridays 6:00-7:00 PM; ROME B104
Teaching Assistant: Liuqing Yang (yangliuqing@gwmail.gwu.edu)

Course Description:
This is a one semester course designed to introduce students to the fundamentals of the SAS System for accessing, managing, analyzing, presenting and summarizing the data. The first part of the course will be devoted to the SAS language and Base SAS procedures. The second part of the course will focus on the SAS macro language. The third part will concentrate on key aspects of the Interactive Matrix Language (IML) as time permits.

Course Prerequisites:
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 prerequisites for the course are an introductory course in programming (STAT 129) and an introductory course in statistics (STAT 51 or 53) or permission of instructor.

Learning Outcomes:
Students are expected to gain an understanding of the SAS language, Base SAS procedures, macro language, and key aspects of SAS/IML. They will develop skills in writing SAS programs for accessing, manipulating and summarizing data, and reporting results using Base SAS and SAS macro facility as well as for matrix manipulation and data step programming using SAS/IML.

Topics:
A. SAS Language and Base SAS Procedures: Getting Started with SAS Language Concepts (Data Step vs. Proc Step, SAS Programs, SAS Libraries; SAS Files, SAS Data Sets, Programming Workspace and Options); Understanding Tokenization and Compilation vs. Execution in SAS; Reading Raw Data Using Different Input Styles for Numeric (including Non-Standard Data Fields) and Character Fields; Reading Multiple Lines of Raw Data per Observation; Reading Multiple Observations per Line of Raw Data; Reading SAS Data Sets; Reading Hierarchical Files; Creating/Transforming Variables; SAS Functions; Controlling Reading and Writing of Variables and Observations in SAS Data Sets; Modifying and Combining SAS Data Sets; Processing Data Iteratively Using DO Loops and Arrays; Selected Utility Procedures for Viewing Variable Attributes, for Editing, Sorting, and Transporting Data; and for Creating User-Defined Formats; Selected Statistical and Reporting Procedures for Describing Data, Summarizing Results and for Generating List and Customized Reports

B. SAS Macro Language: Overview; Ways to Create Macro Variables; Symbol Tables Rules; Processing Macro variables; Referencing Macro Variables Indirectly; Creating and Using Macros; Conditional Processing; Parameter Validation; Iterative Processing in Macro Programming; Storing Macro Programs
C. SAS/IML Programming: Creating, Manipulating and Printing Matrices in SAS/IML; Subscript and Reduction Operations in IML; Comparison between the SAS Data Step and the IML; Reading Raw Data Files into IML; Importing, Exporting, and Editing SAS Data Sets with IML; Functions, Loops, Conditions and Modules in IML; Storage Features, Memory and Workspace; IML Module Library

Assessment Category, Score, Weight and Letter-Grade:
There will be 5 quizzes/programming assignments, a midterm exam and the final exam for both undergraduate and graduate students. However, an additional programming project will be assigned to graduate students who will be taking the course for graduate credit. Undergraduate students will not be allowed to do this additional assignment for graduate credit. Quizzes as well as midterm and final exams are in-class, closed book, closed note and closed Internet. Only programming assignments are open book, open note and open Internet. However, students are not allowed to share with others the SAS code and solutions of these assignments. The quiz/assignment/exam schedules will be announced well in advance. The score and the respective weight by assessment category are shown below.

For undergraduate students:

<table>
<thead>
<tr>
<th>Assessment Category</th>
<th>Score</th>
<th>Weight of Category</th>
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</thead>
<tbody>
<tr>
<td>Quizzes/programming assignments (5)</td>
<td>100 (20 × 5)</td>
<td>25%</td>
</tr>
<tr>
<td>Midterm exam</td>
<td>100</td>
<td>35%</td>
</tr>
<tr>
<td>Final exam</td>
<td>100</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>300</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

For graduate students taking the course for graduate credit:

<table>
<thead>
<tr>
<th>Assessment Category</th>
<th>Score</th>
<th>Weight of Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes/programming assignments (5)</td>
<td>100 (20 × 5)</td>
<td>25%</td>
</tr>
<tr>
<td>Additional assignment</td>
<td>20</td>
<td>5%</td>
</tr>
<tr>
<td>Midterm exam</td>
<td>100</td>
<td>35%</td>
</tr>
<tr>
<td>Final exam</td>
<td>100</td>
<td>35%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>320</strong></td>
<td><strong>100%</strong></td>
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The (end-of-course) letter-grade will be determined based on the total weighted score as follows:
- 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%

Course Policies:
- Lecture handouts including notes, SAS code and SAS output will be posted to Blackboard and will also be distributed in the class.
- The instructor will use SAS’ copyrighted course materials (PowerPoint slides) in the class. As per an agreement with SAS® Institute, only the instructor has been granted permission to present these slides. Students will not have access to the electronic or hard copies of the slides. Photographing these slides is prohibited by law.
- Programming assignments submitted after the deadlines will not be accepted.
- The instructor’s response to students’ e-mails with out-of-class questions may take up to 24 hours.
- There will be no make-up exams 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.

There will be absolutely no tolerance of dishonest conduct during the exams. Severe measures will be taken against dishonest conduct. All students must be familiar with and abide by the provisions of the "Code of Academic Integrity". See https://studentconduct.gwu.edu/code-academic-integrity for details.

Students must turn off their cell phones during class sessions and exams.

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.

Disability Support Services:
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 (Phone):
The UCC offers 24/7 assistance and referral to address issues regarding students’ personal, social, career, and study skills. 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, students should follow the evacuation procedures for the building. After evacuation, they should seek shelter at a predetermined rendezvous location.

Textbooks and Course Materials:


SAS® 9.3 Language Reference (PDF document available online)

Base SAS® 9.3 Procedures Guide (PDF document available online)

SAS® 9.3 Macro Language (PDF document available online)

SAS/IML 9.3 User's Guide (PDF document available online)
For selected lecture topics, there will be reading assignments from textbooks, SAS Proceedings, SAS Blogs or SAS Product Documentation.

**Obtaining SAS Software:**
The SAS License is available free of charge to students who have registered for this course. The license would allow them to install SAS software on their personal computers. To get a copy of SAS software, students will need to bring a signed license agreement form and 2 blank DVDs to Instructional Technology Lab (ITL), The George Washington University, 2130 H Street NW Suite B05A (Phone: 202-994-0485). However, they will not need the Instructor to fill out the departmental approval section on the form since the student roster has already been sent to ITL. This form can be found from the “SAS-license_form” folder at Blackboard.