Course Pre- and Co-requisites: Instructor Approval.

Recommended: The Little SAS Book: A Primer, Fourth Edition by Lora D. Delwiche, Susan J. Slaughter


Course Description: The course is designed for students who want to learn how to analyze and summarize data using SAS. The course begins by introducing the students to basic SAS programming and data manipulation techniques. More advanced themes, such as preliminary data analysis and graphs, are explored later in the semester. The class covers the implementation of several advanced statistical concepts in SAS, including T-tests, ANOVA, non-parametric tests, regression and normality tests. Finally SAS Macros will be examined.

Course Learning Objectives: Upon completing this course, the student will be able to:
1. Use the basic options provided by SAS in a graphic environment.
2. Create SAS data sets and perform basic statistical analysis of them.
3. Create programs in SAS that include elements such as variables, functions, conditional statements, groups/subsets.
4. Sort and Print Data in SAS
5. Summarize data using the SAS procedures for Descriptive Univariate Statistics, Frequency Tables and Correlation.
6. Implement the SAS procedures required to perform T-tests and ANOVA, Collinearity & Normality Tests
7. Use and interpret diverse types of regression in SAS.

Program Competencies Addressed in this Course: The following competencies are addressed in this course:
2. Apply appropriate descriptive statistical methods for summarizing public health data.
3. Conduct descriptive and inferential statistical methods that are appropriate to the different study designs used in public health research.
5. Draw appropriate inferences based on statistical analyses used in public health research.
**Course Requirements:** This is a brief introduction to SAS no more no less. The instructor will present concepts related to SAS and then provide practical examples of how to use such concepts, paying attention to this material is not enough to learn SAS, the student is expected to practice on her/his own after class.

**Major Graded Assignments:** See Course Schedule Summary.

**Course Policies:**

Email – The Official University Correspondence:

*Verify your email address* by going to [www.my.umd.edu](http://www.my.umd.edu).

All enrolled students are provided access to the University’s email system and an email account. *All official University email communication will be sent to this email address* (or an alternate address if provided by the student). Email has been adopted as the primary means for sending official communications to students, so email must be checked on a regular basis. Academic advisors, faculty, and campus administrative offices use email to communicate important and time-sensitive notices.

**Students are responsible for keeping their email address up to date or for redirecting or forwarding email to another address.** Failure to check email, errors in forwarding email, and returned email (from “full mailbox” or “unknown user” errors for example) will not excuse a student from missing University announcement, messages, deadlines, etc. Email addresses can be quickly and easily updated at [www.my.umd.edu](http://www.my.umd.edu) or in-person at the Student Service Counter on the first floor of the Mitchell Building.

For technical support for University email: [www.helpdesk.umd.edu](http://www.helpdesk.umd.edu) or call 301-405-1400.

*Attendance:*

Regular attendance and participation in this class is the best way to grasp the concepts and principles being discussed. However, in the event that a class must be missed due to an illness, the policy in this class is as follows:

1. For every medically necessary absence from class (lecture, recitation, or lab), a reasonable effort should be made to notify the instructor in advance of the class. When returning to class, students must bring a note identifying the date and reason for the absence, and acknowledging that the information in the note is accurate.
2. If a student is absent more than 2 time(s), the instructor may require documentation signed by a health care professional.
3. If a student is absent on days when tests are scheduled or homework are due he or she is required to notify the instructor in advance, and upon returning to class, bring documentation of the illness, signed by a health care professional.

**Absence Policy:**

In accordance with University policy if you are absent for a single (1) lecture due to illness or some form of personal or family emergency, this absence will be considered “excused” and the instructor will accept a note from you attesting to the date of the illness/incident, along with an
acknowledgement that the information is true. Whenever feasible, you should try to contact the instructor in advance.

Multiple or prolonged absences, and absences that prevent attendance at a major scheduled grading event (like an exam or test) will require written documentation from an appropriate health care provider/organization.

A link to pull information on the new policy covering absences from class can be found at http://www.president.umd.edu/policies/v100g.html

Late work and Missed Exams / Assignments:
Both are inadmissible unless there are extraordinary circumstances. Must be discussed with the instructor.

Course Evaluations
The University, the School of Public Health, and the Department of Epidemiology and Biostatistics are committed to the use of student course evaluations for improving the student experience, course and curriculum delivery, and faculty instruction. Your evaluations help instructors improve their courses; help deans and department chairs decide on merit pay for faculty, renewal of contracts, and support tenure and promotion decisions; and help current and future students decide on classes. The system (www.CourseEvalUM.umd.edu) will open Tuesday, December 2 - Sunday December 14 for Fall 2014 courses.

Commercial Use of Course Materials:
In accordance with the University of Maryland Policy on Intellectual Property (http://www.president.umd.edu/policies/iv320a.html), course instructors own the copyright in all course materials they create, including written lectures, power point presentations, study materials, and tests (Course Materials) and in the selection of readings and assignments for their courses. Course Materials are protected by copyright because they exist in a tangible medium; e.g., written, electronic, audio-visual, and are the original works of the faculty.

Available Support Services: SAS is popular software for statistical analysis; hence there are many resources available to learn about it. UMD’s Engineering and Physical Sciences Library has many books devoted to this subject and there are several free tutorials available online. Also, the class is expected to be registered for SAS® OnDemand for Academics.

Grading Procedures:
1. Attendance: Students will be responsible for any announcements and material covered in class, whether or not they are present.
2. Homework: You can work on homework with other students in the class. However simply copying another student’s answers to homework problems is strongly discouraged (negative consequences of this academic strategy are usually experienced during examinations). No late homework will be accepted.
3. Tests: All tests might be closed book and closed-note. Tests will be given during class and will be loosely based on the assigned homework and the lectures. A total of two tests will
be given during the semester. If due to an emergency, you cannot take the test, please notify me (if possible) prior to the exam.

4. Quizzes: Short quizzes might be given at the start of the class. Each quiz will be counted as a homework assignment. Same rules as the tests.

Grading Method

1. Homework 50%
2. Midterm Exam: 25%
3. Final Exam: 25%

Grading Scale:

90% - 93% → A-, 94% - 97% → A, 98%+ → A+
80% - 83% → B-, 84% - 87% → B, 88% - 89% → B+
70% - 73% → C-, 74% - 77% → C, 78% - 79% → C+
60% - 63% → D-, 64% - 67% → D, 68% - 69% → D+
less than 60% → F

Course Outline / Course Calendar:

<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Topic</th>
<th>Assignments</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>9/3/2014</td>
<td>Lecture 1 “Introduction to SAS software”</td>
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<tr>
<td>2</td>
<td>9/10/2014</td>
<td>Lecture 1 “Introduction to SAS software” – cont.</td>
<td>#1</td>
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<tr>
<td>3</td>
<td>9/17/2014</td>
<td>Lecture 2 “Getting data into SAS”</td>
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<tr>
<td>4</td>
<td>9/24/2014</td>
<td>Lecture 2 “Getting data into SAS” – cont.</td>
<td>#2</td>
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<td>5</td>
<td>10/1/2014</td>
<td>Lecture 3 “Variables, Iterative and Repetitive Statements”</td>
<td>#3</td>
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<tr>
<td>6</td>
<td>10/8/2014</td>
<td>Lecture 4 “Modifying and combining SAS data sets”</td>
<td>#4</td>
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<tr>
<td>7</td>
<td>10/15/2014</td>
<td>Lecture 5 “Basic procedures”</td>
<td>#5</td>
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<tr>
<td>8</td>
<td>10/22/2014</td>
<td>Lecture 6 “Summarizing data”</td>
<td>#6</td>
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<td>9</td>
<td>10/29/2014</td>
<td>Midterm Exam</td>
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<td>10</td>
<td>11/5/2014</td>
<td>Lecture 7 “Generate Reports, SAS graphs”</td>
<td>#7</td>
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<td>11</td>
<td>11/12/2014</td>
<td>Lecture 8 “Statistical Procedures: Tests”</td>
<td>#8</td>
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<td>12</td>
<td>11/19/2014</td>
<td>Lecture 9 “Statistical Procedures: Regression”</td>
<td>#9</td>
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<td>13</td>
<td>11/26/2014</td>
<td>Lecture 10 “Collinearity &amp; Normality Tests”</td>
<td>#10</td>
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<tr>
<td>14</td>
<td>12/3/2014</td>
<td>Lecture 11 “ Macros”</td>
<td>#11</td>
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<tr>
<td>15</td>
<td>12/10/2014</td>
<td>Review</td>
<td></td>
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<td>16</td>
<td>12/17/2014</td>
<td>Final Exam</td>
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Note: Numbers in brackets after learning objectives show linkage between material covered in each session and the numbered program competencies shown on page 1 of this syllabus.

Session Outline

9/3/2014

Topic: Lecture 1 “Introduction to SAS software”

Learning Objectives for Session [Relevant Program Competencies: NA]
- Become familiar with SAS for Windows’ graphic environment
- Become familiar with SAS for Windows’ programming environment
- Create data files and make them permanent
- Create datasets using the statement ‘cards’

Recommended readings: Class notes, SAS help for the statements CARDS and LIBNAME, the procedure PROC CONTENTS and DATA steps.

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<tr>
<th>Session 2</th>
<th>9/10/2014</th>
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Learning Objectives for Session [Relevant Program Competencies: NA]
- Gain practical experience on the basics of SAS

Assignment Lecture 1 #1 Due date: 9/16/2013

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<th>Session 3</th>
<th>9/17/2014</th>
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<tr>
<td>Topic: Lecture 2 “Getting data into SAS”</td>
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Learning Objectives for Session [Relevant Program Competencies: NA]
- Read data from files
- Understand the usage of formats/informats
- Exporting and Importing data using the point-and-click method

Recommended readings: Class notes and SAS help for the statements FORMAT, INPUT and INFILE and the procedure PROC FORMAT.

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<th>Session 4</th>
<th>9/24/2014</th>
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<td>Topic: Lecture 2 “Getting data into SAS“ - cont.</td>
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Learning Objectives for Session [Relevant Program Competencies: NA]
- Gain practical experience loading data into SAS

Assignment Lecture 2 Due date: 9/30/2013

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<th>Session 5</th>
<th>10/1/2014</th>
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<tr>
<td>Topic: Lecture 3 “Variables, Iterative and Repetitive Statements”</td>
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Learning Objectives for Session [Relevant Program Competencies: NA]
- Variables
- Understand the conditional statement
- Use the comparison and combination operators
- Understand repetitive structures

Recommended readings: Class notes and SAS help for the statements DO, IF, ELSE, OR, AND, WHILE and ARRAY.

Assignment Lecture 3 –Due date: 10/7/2013
### Session 6 10/8/2014

**Topic:** Lecture 4 “Modifying and combining SAS data sets”

**Learning Objectives for Session** *(Relevant Program Competencies: NA)*
- Become familiar with the SAS statements needed to replicate a dataset.
- Understand how to merge, append and update SAS datasets
- Be able to save procedure results to SAS datasets

**Recommended readings:** Class notes and SAS help for the statements SET, MERGE, BY, UPDATE and OUT and the procedure PROC SORT

**Assignment Lecture 4 – Due date: 10/14/2013**

### Session 7 10/15/2014

**Topic:** Lecture 5 “Basic Procedures”

**Learning Objectives for Session**
- Become familiar with the options for PROC PRINT
- Become familiar with the options for PROC SORT
- Become familiar with the options for PROC MEANS

**Recommended readings:** Class notes and SAS help for the statements TITLE and FOOTNOTE and the procedures PROC PRINT, PROC SORT and PROC MEANS.

**Assignment Lecture 5 – Due date: 10/21/2013**

### Session 8 10/22/2014

**Topic:** Lecture 6 “Summarizing data”

**Learning Objectives for Session** *(Relevant Program Competencies: 2, 3 and 4)*
- Be able to run and interpret the SAS procedure dedicated to Univariate analysis.
- Understand how to implement correlation in SAS
- Create Frequency Tables

**Recommended reading:** Class notes and SAS help for the procedures PROC UNIVARIATE, PROC CORR and PROC FREQ and the statement WEIGHT.

**Assignment Lecture 6 – Due Date: 10/28/2013**

### Session 9 10/29/2014

**Midterm**

### Session 10 11/5/2013

**Topic:** Lecture 7 “Generate Reports, SAS graph”

**Learning Objectives for Session** *(Relevant Program Competencies: 2, 3 and 4)*
- Generate Reports using SAS’s Output Delivery System
- Draw charts
- Draw scatterplots

Recommended readings: Class notes and, SAS help for the PROC GCHART and PROC GPLOT and the statement ODS.

Assignment Lecture 7–Due Date: 11/11/2012

### Session 11 11/12/2014

**Topic:** Lecture 8 “Statistical Procedures: Tests”

Learning Objectives for Session [Relevant Program Competencies: 2,3 and 4]
- Perform T–test
- Perform ANOVA tests
- Perform non-parametric tests

Recommended readings: Class notes, SAS help for PROC TTEST, PROC ANOVA and PROC PAR1WAY

Assignment Lecture 8–Due Date: 11/18/2013

### Session 12 11/19/2014

**Topic:** Lecture 9 “Regression”

Learning Objectives for Session [Relevant Program Competencies: 2,3 and 4]
- Perform and interpret Linear Regression in SAS
- Perform and interpret Logistic Regression in SAS
- Perform and interpret Poisson Regression in SAS

Recommended readings: Class notes, SAS help for PROC REG, PROC LOGISTIC and PROC GENMOD

Assignment Lecture 9–Due Date: 11/25/2013

### Session 13 11/26/2014

**Topic:** Lecture 10 “Collinearity & Normality Tests”

Learning Objectives for Session [Relevant Program Competencies: 2,3 and 4]
- Perform Collinearity Tests and understand how to apply them in the context of linear regression
- Perform Normality Tests and understand how to use them to determine the type of test necessary for a given dataset

Recommended readings: Class notes, SAS help for the options NORMAL of PROC UNIVARITE, and VIF and COLLIN of the statement MODEL of PROC REG.

Assignment Lecture 10–Due Date: 12/2/2013

### Session 14 12/3/2014
Topic: Lecture 11 “MACROS”

Learning Objectives for Session [Relevant Program Competencies: NA]
- Create SAS Macros

Recommended readings: Class notes, SAS help for the macro-statements %MACRO, %MEND and %LET.

Assignment Lecture 11–Due Date: 12/9/2013

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<th>Session</th>
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<tr>
<td>15</td>
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Additional Literature, Websites and Other Resources:

*Instructor’s Personal Webpage:* http://brac.umd.edu/~raulcruz/

*Student Grade Calculator EPIB698E Fall 2014*

*Securing SAS Outside the Classroom (Exercise 0)*
1. Desktop version from departments
2. SAS University
   - https://support.sas.com/edownload/software/DPUNVE001_VirtualBox
3. SAS® OnDemand for Academics
   - Guide
   - Manual
4. Laboratories in UMD (http://www.oit.umd.edu/as/cl/)
   - Regents Drive Garage (Building #202) in Room 0504. The lab is open 24 hours, 7 days per week
   - SPH: Collaborative Learning Studio Media room (#0227) and Room 0222

Note: The contents of this syllabus are a just a plan for the work to be completed during the semester; it might be changed if deem necessary by the instructor.

**Homework Format:**
Homework will be submitted online as a single MS Word File. For each assigned problem the following information must be included:
- The problem statement. This is material can be just copied from the document provided by the instructor.
- SAS Code that solves the problem.
- Solution for the problem. This can be a screenshot shown the SAS Output or the SAS Output directly.

Bring USB thumb drive to save programs and files.

**Critical university policies:**

*Religious Observances:*
The University System of Maryland policy provides that students should not be penalized because of observances of their religious beliefs; students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is
missed due to individual participation in religious observances. **It is the student’s responsibility to inform the instructor in advance of any intended absences for religious observance.**

**Special Accommodations / Disability Support Services:**
If you have a documented disability and wish to discuss academic accommodations for test taking or other needs, you will need documentation from Disability Support Service (301-314-7682). If you are ill or encountering personal difficulties, please let the instructor know as soon as possible. You can also contact Learning Assistance Services (301-314-7693) and/or the Counseling Center (301-314-7651) for assistance.

**Academic Integrity:**
The University’s code of academic integrity is designed to ensure that the principle of academic honesty is upheld. Any of the following acts, when committed by a student, constitutes academic dishonesty:

- **CHEATING:** intentionally using or attempting to use unauthorized materials, information, or study aids in an academic exercise.
- **FABRICATION:** intentional and unauthorized falsification or invention of any information or citation in an academic exercise.
- **FACILITATING ACADEMIC DISHONESTY:** intentionally or knowingly helping or attempting to help another to violate any provision of this code.
- **PLAGIARISM:** intentionally or knowingly representing the words or ideas of another as one’s own in any academic exercise.

For more information see: [http://www.shc.umd.edu/code.html](http://www.shc.umd.edu/code.html).

The Honor Pledge is a statement undergraduate and graduate students should be asked to write by hand and sign on examinations, papers, or other academic assignments. The Pledge reads:

*I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination.*

The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit [http://www.shc.umd.edu](http://www.shc.umd.edu).

**Inclement Weather / University Closings:**
In the event that the University is closed for an emergency or extended period of time, the instructor will communicate to students regarding schedule adjustments, including rescheduling of examinations and assignments due to inclement weather and campus emergencies. Official closures and delays are announced on the campus website ([http://www.umd.edu](http://www.umd.edu)) and snow phone line (301-405-SNOW), as well as local radio and TV stations.