

**PubH 6420, Section 320**  
**Introduction to SAS Programming**  
**Summer 2017**

(updated 4/3/18)

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**Credits:** 1  
**Meeting Days:** June 11-August 3, 2018  
**Meeting Time:** online at [moodle.umn.edu](http://moodle.umn.edu)  
**Meeting Place:** online at [moodle.umn.edu](http://moodle.umn.edu)

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**I. Course Description**

This class is an introduction to the use of the SAS programming language for the analysis of biomedical data. After an introduction to the SAS environment on a PC, SAS will be used to write programs for reading and processing data, and for performing descriptive and basic statistical analyses.

**Acknowledgments**

This course was created with contributions from the SPH Office of E-Learning Services.

**II. Course Prerequisites**

None

**III. Course Goals and Objectives**

By the end of the course, students should be able to write SAS programs for data management, presentation, and analyses.

- Create and run SAS programs on a PC.
- Read raw input files in various formats and create SAS datasets.
- Create new variables from other data.
- Use basic SAS procedures to describe data numerically and graphically.
- Annotate SAS output with titles, labels, and formats.
- Work with SAS datasets: sort, subset, merge, and re-format SAS datasets
- Use SAS procedures for basic statistical inference: Chi-square tests, T-Tests, ANOVA, Regression, etc.

- Export SAS data and output to other computers and software

#### IV. Methods of Instruction and Work Expectations

This course will consist of 12 online lessons, text readings, self tests, 6 programming assignments, and 1 exam.

#### V. Course Text and Readings

Textbooks are available at the U of MN Bookstore in Coffman Union on the Minneapolis Campus (<http://www.bookstores.umn.edu/shopping/textbooks.html>) or via on-line services such as Amazon (<http://www.amazon.com>). Be sure to check for the best prices, as sometimes these services and others will offer the book used.

**Required Textbooks:** Delwiche and Slaughter: The Little SAS Book, 5<sup>th</sup> edition, ISBN-13: 978-1612903439 (hereinafter LSB).

**Required Software:** SAS version 9.2 or higher.

#### VI. Course Outline/Weekly Schedule

Date	Lesson	Reading	Assignments: Due Date
6/11-6/14/18	1 – Introduction to SAS Programming This lesson will cover some of the basics of using SAS: - SAS environment - program syntax - structure of data, types of data - reading in and displaying data - running program, generating log and output	LSB: Chapter 1	<b>Introductions, due 6/15</b>  Practice Exercise, due 6/15 (not graded)  Lesson 1 Self Test, due 6/15 (not graded)
6/15-6/18/18	2 – Reading Data into SAS - list input, comma and tab delimited data, data from Excel, column input, informats - reading data from external file - problems in reading data	LSB: Chapter 2:1,3-8,12,14-17.  Programs 1,2	Lesson 2 Self Test, due 6/18 (not graded)  <b>Assignment 1 due 6/20</b>
6/19-6/22/18	3 – Describing Data Part 1 - PROC PRINT, MEANS, UNIVARIATE, SGPLOT - summary statistics, graphical displays, controlling output generated	LSB: 4:1-3,5,10; 5:1-2,4; 8:1-9;9:1-3  Program 3	Lesson 3 Self Test, due 6/22 (not graded)
6/23-6/26/18	4 – Describing Data Part 2 - PROC FREQ, SGPLOT, CORR, REG - frequency distribution, 2-way tables, correlation, simple regression	LSB: 4:12;9:8-11  Program 4	Lesson 4 Self Test, due 6/26 (not graded)  <b>Assignment 2 due 6/28</b>
6/27-6/30/18	5 – Creating Variables in the Data Step - direct assignments - if, then, else statements - SAS functions - handling missing data	LSB: 3:1-6;11-12  Programs 5,6	Lesson 5 Self Test, due 6/30 (not graded)
7/1-7/4/18	6 – Formatting Output; Working with Dates - titles, labels, and formats - PROC FORMAT	LSB: 3:8-9; 4:1; 6-8  Programs 7-9	Lesson 6 Self Test, due 7/4 (not graded)  <b>Assignment 3</b>

	- FORMAT statement - Working with dates		<b>due 7/6</b>
7/5-7/8/18	7 – Working with SAS Datasets - sub-setting and merging datasets - SET and MERGE statements - KEEP option and statement - WHERE statement and logical if statements - creating and using permanent SAS datasets - LIBNAME statement	LSB: 2:18-21; 3:7; 6:1-5,9,11-13  Programs 10-13	Lesson 7 Self Test, due 7/8 (not graded)
7/9-7/12/18	8 – Creating SAS Datasets from Procedures - ODS OUTPUT - OUTPUT statement - PROC RANK	LSB: 4:11; 5:3  Programs 14-15	Lesson 8 Self Test, due 7/12 (not graded)  <b>Assignment 4 due 7/14</b>
7/13-7/16/18	9 – Restructuring SAS Datasets - creating multiple observation/patient dataset from 1-observation/patient dataset and vice-versa - Computing frequency distributions for multiple responses	LSB: 3:10; 6:10,14-15  Programs 16-18	Lesson 9 Self Test, due 7/16 (not graded)
7/17-7/20/18	10 – Statistical Testing and Modeling Part 1 - Chi-square, T-Tests, ANOVA, Non-parametric tests - Reading in frequency counts as raw data PROC FREQ, TTEST, ANOVA, GLM, NPAR1WAY	LSB: 9:4-7,12-13  Programs 19-20	Lesson 10 Self Test, due 7/20 (not graded)  <b>Assignment 5 due 7/22</b>
7/21-7/24/18	11 – Statistical Testing and Modeling Part 2 - modeling binary data, logistic regression - modeling continuous data, linear regression - introduction to time-to-event analyses - PROC LOGIST, REG, LIFETEST, PHREG	LSB 9:10-11  Programs 21-22	Lesson 11 Self Test, due 7/24 (not graded)
7/25-7/28/18	12 – Special Topics - Exporting SAS data - Macro variables - Introduction to table generation PROC EXPORT, TABULATE	LSB: 4:13-17; 7:1-8  Programs 23-25	Lesson 12 Self Test, due 7/28 (not graded)  <b>Assignment 6 due 7/30</b>
7/29-8/3/18	Final Exam (Parts 1 and 2)		<b>Final Exam Due 8/3</b>

## VII. Evaluation and Grading

### Grading Criteria:

Total points will be assigned based on 1 exam and 6 assignments with the following weightings.

Activity	% contribution to final course grade
Assignments: 60% (12% each, best 5 of 6 scores)	60%
Final Exam Part 1 (20 points) Final Exam Part 2 (20 points)	40%
TOTAL	100%

Grades will be assigned as follows:

88-100%	A
75-87%	B
65-74%	C
< 65%	No credit

Grading options are A-F or S-N. At least a 65% score is needed to receive a grade of S.

Exam is open book and open notes. Assignments must be submitted on time to receive full credit. Assignments may be handed in up to 2 days late for 2/3 credit. After two days there is no credit.

The University utilizes plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following:

A	4.000 - Represents achievement that is outstanding relative to the level necessary to meet course requirements
A-	3.667
B+	3.333
B	3.000 - Represents achievement that is significantly above the level necessary to meet course requirements
B-	2.667
C+	2.333
C	2.000 - Represents achievement that meets the course requirements in every respect
C-	1.667
D+	1.333
D	1.000 - Represents achievement that is worthy of credit even though it fails to meet fully the course requirements
S	Represents achievement that is satisfactory, which is equivalent to a C- or better.

**For additional information, please refer to:**

<http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html>.

### Course Evaluation

The SPH will collect student course evaluations electronically using a software system called CoursEval: [www.sph.umn.edu/courseeval](http://www.sph.umn.edu/courseeval). The system will send email notifications to students when they can access and complete their course evaluations. Students who complete their course evaluations promptly will be able to access their final grades just as soon as the faculty member renders the grade in SPHGrades: [www.sph.umn.edu/grades](http://www.sph.umn.edu/grades). All students will have access to their final grades through OneStop two weeks after the last day of the semester regardless of whether they completed their course evaluation or not.

Student feedback on course content and faculty teaching skills are an important means for improving our work. Please take the time to complete a course evaluation for each of the courses for which you are registered.

### **Incomplete Contracts**

A grade of incomplete "I" shall be assigned at the discretion of the instructor when, due to extraordinary circumstances (e.g., documented illness or hospitalization, death in family, etc.), the student was prevented from completing the work of the course on time. The assignment of an "I" requires that a contract be initiated and completed by the student before the last official day of class, and signed by both the student and instructor. If an incomplete is deemed appropriate by the instructor, the student in consultation with the instructor, will specify the time and manner in which the student will complete course requirements. Extension for completion of the work will not exceed one year (or earlier if designated by the student's college). For more information and to initiate an incomplete contract, students should go to SPHGrades at: [www.sph.umn.edu/grades](http://www.sph.umn.edu/grades).

### **University of Minnesota Uniform Grading and Transcript Policy**

A link to the policy can be found at [onestop.umn.edu](http://onestop.umn.edu).

## **VIII. Other Course Information and Policies**

### **Grade Option Change** (if applicable):

For full-semester courses, students may change their grade option, if applicable, through the second week of the semester. Grade option change deadlines for other terms (i.e. summer and half-semester courses) can be found at [onestop.umn.edu](http://onestop.umn.edu).

### **Course Withdrawal:**

Students should refer to the Refund and Drop/Add Deadlines for the particular term at [onestop.umn.edu](http://onestop.umn.edu) for information and deadlines for withdrawing from a course. As a courtesy, students should notify their instructor and, if applicable, advisor of their intent to withdraw.

Students wishing to withdraw from a course after the noted final deadline for a particular term must contact the School of Public Health Office of Admissions and Student Resources at [sph-ssc@umn.edu](mailto:sph-ssc@umn.edu) for further information.

### **Student Conduct Code:**

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: *Student Conduct Code*. To review the Student Conduct Code, please see: [http://regents.umn.edu/sites/default/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf).

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."

### **Use of Personal Electronic Devices in the Classroom:**

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference: <http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html>.

### **Scholastic Dishonesty:**

You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in

cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code: [http://regents.umn.edu/sites/default/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf)) If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see: <http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html>.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: <http://www1.umn.edu/oscai/integrity/student/index.html>. If you have additional questions, please clarify with your instructor for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.

**Makeup Work for Legitimate Absences:**

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see: <http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html>.

**Appropriate Student Use of Class Notes and Course Materials:**

Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: <http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html>.

**Sexual Harassment:**

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: <http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf>

**Equity, Diversity, Equal Opportunity, and Affirmative Action:**

The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: [http://regents.umn.edu/sites/default/files/policies/Equity\\_Diversity\\_EO\\_AA.pdf](http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf).

**Disability Accommodations:**

The University of Minnesota is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center Student Services is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DRC at 612-626-1333 or [drc@umn.edu](mailto:drc@umn.edu) to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with DS and have a current letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course.

For more information, please see the DS website, <https://diversity.umn.edu/disability/>.

**Mental Health and Stress Management:**

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: <http://www.mentalhealth.umn.edu>.

**The Office of Student Affairs at the University of Minnesota:**

The Office for Student Affairs provides services, programs, and facilities that advance student success, inspire students to make life-long positive contributions to society, promote an inclusive environment, and enrich the University of Minnesota community.

Units within the Office for Student Affairs include, the Aurora Center for Advocacy & Education, Boynton Health Service, Central Career Initiatives (CCE, CDes, CFANS), Leadership Education and Development – Undergraduate Programs (LEAD-UP), the Office for Fraternity and Sorority Life, the Office for Student Conduct and Academic Integrity, the Office for Student Engagement, the Parent Program, Recreational Sports, Student and Community Relations, the Student Conflict Resolution Center, the Student Parent HELP Center, Student Unions & Activities, University Counseling & Consulting Services, and University Student Legal Service.

For more information, please see the Office of Student Affairs at <http://www.osa.umn.edu/>.

**Academic Freedom and Responsibility: *for courses that do not involve students in research:***

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.\*

*\* Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".*

**Student Academic Success Services (SASS): <http://www.sass.umn.edu>:**

Students who wish to improve their academic performance may find assistance from Student Academic Support Services. While tutoring and advising are not offered, SASS provides resources such as individual consultations, workshops, and self-help materials.

*Template update 9/2014*