

Prefix, Number and Name of Course:

ACM 614: Topics in Statistical and Data Analysis Software for Math and Science Professionals

Credit Hours: 1

In Class Instructional Hours: 1

Labs: 0

Field Work: 0

Catalog Description:

Prerequisite: Instructor Permission

Survey of statistical and data programming software and their applications to real life problems in computational mathematics. Analysis of data to produce reports and presentations for diverse audiences with a focus on understanding the syntax and use of statistical programming languages.

Reasons for Addition:

The reason for addition of this course is to create a one-semester-hour core module in the use and application of statistical analysis software to problem solving in professional, applied and computational mathematics. This course is in response to the facts that (1) students in a professional program should know how to translate theory into practical applications, in this case through the use of statistical analysis software, and (2) that statistical data analysis (and requisite fluency in statistical programming software packages) is a skill in high demand in business, government, education, and non-profit sectors.

| Student Learning Outcomes: Students will: | Course Content References: | Assessment: |
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| 1. write programs to analyze data using different statistical programming languages. | II,III,IV,VI | 1. Individual homework assignments, examinations, portfolios, and computer projects. |
| 2. design and implement algorithms to analyze data using statistical programming languages. | I,II,III,IV,VI | 2. Individual homework assignments, examinations, portfolios and computer projects. |
| 3. analyze, compare and contrast the advantages and disadvantages of different statistical programming languages. | I,II,III,IV,V,VI | 3. Individual homework assignments, group work, examinations and computer projects. |

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| 4. create reports and presentations using typesetting software. | IV, VI | 4. Individual homework assignments, group work, examinations, performance based assessment and computer projects. |
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Course Content:

I. Introduction to SAS Software

- A. The SAS Language
- B. SAS Data Sets
- C. The Two Parts of a SAS Program; DATA and PROC steps
- D. Choosing a Mode for Submitting SAS Programs
- E. Windows and Commands in the SAS Windowing Environment
- F. Submitting a Program in the SAS Windowing Environment
- G. Reading the SAS Log
- H. Viewing Your Results in the Output Window
- I. SAS Data Libraries
- J. Using SAS System Options

II. Getting Data into SAS

- A. Methods for Getting Data into SAS; Viewtable Window; Import Wizard; Proc Import
- B. Reading Raw Data
- C. Mixing Input Styles
- D. Temporary versus Permanent SAS Data Sets
- E. SAS Data libraries. ODBC connections to SQL servers, Teradata servers, etc.

III. Working with Data in SAS in the SAS Data Step

- A. Creating and Redefining Variables
- B. Using SAS Functions
- C. Grouping Observations with IF-THEN/ELSE Statements
- D. Simplifying Programs with Arrays
- E. Using Shortcuts for Lists of Variable Names
- F. Local and global macro variables

IV. Sorting, Printing, and Summarizing Data in SAS

- A. Using SAS Procedures
- B. Sorting, summarizing and printing your Data with PROC SORTPROC TABULATE, and PROC SQL
- C. Graphing in SAS: PROC UNIVARIATE, PROC SGPLOT
- D. Writing Simple Custom Reports (ODS PDF Output; Proc Export)

V. Introduction to the R statistical programming language

- A. Why learn R; Comparison of R and SAS
- B. Mixing R with SAS
- C. Installing R

- D. Running R interactively and in batch mode
- E. Integrated development environments (Rstudio, Eclipse)
- F. Graphical user interfaces

VI. R programming language basics

- A. Simple calculations
- B. Data structures (vectors, matrices, arrays, lists)
- C. Data acquisition
- D. Importing data from Excel and SAS
- E. Writing Simple Custom Reports

Resources:

Scholarships in the Field:

Cristina B. (2010). *The Little SAS Book: A Primer (4th ed.)*. Alexandria: American Statistical Association.

Marasinghe, M. G., Kennedy, W. J. 1. (2008). *SAS for data analysis: Intermediate statistical methods*. New York. Springer.

Muenchen, R.A. (2011). *R and SAS for SPSS Users*. Springer.

Peng, C. Y. J. (2009). *Data Analysis Using SAS*. Los Angeles: SAGE.

Kleinman, K., & Horton, N. (2010). *SAS and R Data Management, Statistical Analysis, and Graphics*. Chapman and Hall CRC.

Field, A. P., Miles, J., & Field, Z. (2012). *Discovering statistics using R*. London ; Thousand Oaks, Calif.: Sage.

Illiott, A. C., & Woodward, W. A. (2010). *SAS essentials: A guide to mastering SAS for research*. San Francisco, CA: Jossey-Bass.

Periodicals:

SIAM Journal on Computing
Journal of Statistical Software

Electronic and/or Audiovisual Resources:

The SAS resource center: <https://www.sas.com/resources/>

Internet Data Sources for Social Scientists:
<http://www.ciser.cornell.edu/info/datasource.shtml>

Institute for Digital Research and Education, SAS Resources:
<http://www.ats.ucla.edu/stat/sas/>