***Indirect Methods** *assess opinions or thoughts about student knowledge, skills, attitudes, learning experiences, and perceptions. Examples of indirect measures are student surveys about instruction; focus groups; student self-evaluations.*

After the second offering of the course, please submit an initial report summarizing the GE assessment results following the format of the "Assessment Report Requirements" in Appendix 11.

7. *For ASC units only*: If the GE request applies to a new course and the new course can also count toward the major of the submitting unit (whether as a required course or as an elective), please include the curriculum map of that program to which you have added the newly proposed course, indicating the program goal(s) and levels it is designed to meet. If the course is not new but the request involves moving the course to a new level or place on the major's curriculum map, the updated map will need to be provided as well.

Required Coursework for Students:

The intent of this General Education category is to enable students to deal with the gathering, presentation, and interpretation of data. Students should develop an understanding of problems of measurement, be able to deal critically with numerical and graphical arguments, and recognize the uses and misuses of statistics and related quantitative arguments. Courses should include exposure to fundamental ideas of probability, involve the use of computational technology in problems of data analysis, and include opportunities to present data using summary measures and graphical techniques. Specialized courses within the B. S. major may also be proposed to satisfy this requirement.

The ASCC Natural and Mathematical Sciences Panel and the full ASCC will use these guidelines (approved by the ASCC on April 11, 2014) as the basis for evaluation of data analysis courses. The fulfillment of the following criteria would make the course eligible to be considered for GE Data Analysis status with the final decision based on the overall rigor and sophistication of the course. Prerequisite courses can count in the requirement (for example Statistics 4202 meets the requirement because Statistics 4201 is a prerequisite).

Core requirements (at least 4 instructional hours spent on each bullet):

- Notions of probability. The axioms of probability, and basic probability calculations. Random variables, and probability calculations using random variables. Expected values.
- Basics of statistical inference. Moving from a sample to a population. Bias and variance. Understanding the margin of error and confidence. The logic of statistical testing. The misuse of statistics.

Additional requirements (At least two out of four, with at least 3 instructional hours spent on each numbered item):

1. Understanding where data come from. Data sources. Discriminating between observational and experimental studies. (Random) sampling.
2. Summarizing data graphically and numerically. Discriminating between good and bad summaries. Understanding the advantages and disadvantages of a given summary.
3. Methods of statistical inference. Statistical testing. Constructing confidence intervals. Making quantitative statistical arguments using data. Understanding and verifying assumptions underlying a given inference.

4. Statistical modeling (e.g., regression models, analysis of variance). Interpreting the parameters underlying statistical models. Model assessment.

Thus, in a three-semester-hour course, for example, at least one third of the class should be spent teaching topics in probability and statistics.

Possible software: The R Project for Statistical Computing (www.r-project.org) is an open source statistical software package. Commercial packages for which the university has a license include MATLAB, Mathematica, Minitab, JMP, SAS, SPSS, and Stata.

Useful reference: "Statistics: Concepts and Controversies, 8th ed." by Moore and Notz (The Statistics 1350 text).