ROWAN UNIVERSITY
Department of Mathematics
Syllabus
STAT 02.102 – Statistical Literacy

CATALOG DESCRIPTION:

STAT 02.102 – Statistical Literacy - 3 s.h.

Prerequisites: Must meet one of these **General Requirements as Pre-requisite:**

Must have Completed: ALG 62 or ALGR 62 or SO2 400 Or Minimum Grade of D- on either of these Course or Test: <u>MATH</u> 01100 to 01499 or Course or Test: <u>STAT</u> 02100 to 02499 or   A02 17 **or** S12 440 or Math 01075 **or Minimum Grade of S on either: MATH 01090, Math 01094, Math 01095 or course or Test: Math 03100 to 3499. Cannot be taken concurrently.**

<u>**Course Description:**</u>
This course aims to introduce non-STEM majors to the critical thinking skills they need to understand statistical topics that they may encounter in the popular media or their future careers. Students will learn to critically evaluate the statistical information they encounter during everyday life, with a focus on becoming intelligent consumers, rather than producers, of data. Emphasis will be placed on discussing and analyzing cases studies drawn from a variety of professional disciplines as well as the popular press.

OBJECTIVES:
The overall goal of this course is to introduce students to statistical reasoning and interpretation of data. Given that most students taking this course are ultimately going to be consumers, as opposed to producers, of statistics, the primary focus will be on teaching students how to identify valid statistical information and avoid being misled by biased or poorly designed studies. Inference based bootstrapping and randomization distributions will be taught rather than the less intuitive, traditional methods currently emphasized in our Statistics I (Stat 02260) course.

Course / Learning Objectives:
1.   Student will understand and apply the fundamental concepts of sampling and probability.
     a.   1.1. Student will learn the fundamental concepts of sampling and be familiar with common sampling schemes and recognize sampling schemes in real-world situations including media and case studies.
     b.   1.2 Student will learn the basic concepts of probability, and be able to identify some fallacious arguments involving probability.
2.   Students will interpret basic computed numerical summaries and graphical displays coming from statistical software computed/created by the student or published in an article/case study.
     a.   2.1 Students will learn to interpret basic computed numerical summaries and graphical displays coming from statistical software computed/created by the student or published in an article/case study.
3.   Students will understand the purpose behind interval estimation and tests of hypotheses.
     a.   3.1 Students will be able to explain the rationale behind interval estimation and tests of hypotheses.
4.   Students will understand simulation based distributions.
     a.   4.1 Students will utilize technology to produce appropriate bootstrap distributions and randomization based distributions.
5.   Students will understand the basic concepts of simulation based statistical inferences.
     a.   5.1 Students will understand how to use a bootstrap distribution for applying the concepts of estimation and confidence intervals.
     b.   5.2 Students will understand the concepts of decision making with statistical tests of hypotheses and use randomization distributions to test parameter claims.

Rowan Core (General Education)

Starting in the Fall 2018, first-year undergraduate students at Rowan University must complete the new general education requirements, known as Rowan Core. (Continuing students and new transfer students will follow the existing general education requirements.) Students in Rowan Core must complete course requirements in six literacies: Artistic, Communicative, Global, Humanistic, Quantitative and Scientific. This course belongs to the Quantitative Literacy. All students in this course will be assessed on the following Rowan Core Learning Outcomes for this literacy:

#1- Students can define basic statistical and regression vocabulary and also qualitatively describe the meanings relative to a set of given data (e.g. mean vs. median, what does the standard deviation represent; correlation coefficients, and model parameters/coefficients)

#6- Students can perform basic analyses on both discrete and continuous data.

#9- Students will apply algorithmic thinking to quantitative, real world problems.

Topical Outline/Content:

Unit 1: Evaluate the use of data in real world situations (approx. 3.5 weeks)
- Understanding the benefits and risks of using statistics
- Recognizing measurements, mistakes, and misunderstandings as presented in case studies and/or other readings
- Understanding appropriate sampling strategies and study design

Unit 2: Understanding displays and summaries of data (approx.. 4 weeks)
- Using technology to summarize data, produce graphical displays, and calculate traditional measures of center, variation, and relative standing
- Understanding and drawing appropriate conclusions from plots, graphs, and summaries of data
- Understanding the impact of outliers
- Understanding the difference between correlation and causation
- Understanding relationships between categorical variables, including the concepts of relative risk and odds ratios, and identifying the common ways by which the media misrepresent risk

Unit 3: Understanding uncertainty in life: Probability (approx. 1 week)
- Understanding probability and difference between relative-frequency-based probability and personal (i.e., subjective) probability.
- Psychological influences on personal probability and common distortions
- Knowing when intuition differs from relative frequency

Unit 4: Understanding basic statistical inferences through simulation (approx. 4.5 weeks)
- Creating bootstrap distributions for use in estimating parameters via bootstrap confidence intervals
- Understanding and interpreting confidence Intervals reported by the news media
- Using randomization distributions as a basis for testing claims regarding a single parameter, the difference between two parameters, and the association between two categorical variables
- Evaluating hypothesis tests that have been reported in discipline-specific literature, the popular media, and case studies.
- Understanding the distinction between statistical significance and practical significance.
- Understanding the difference between Type I and Type II errors
- Discussing the role of ethics in statistics.

POSSIBLE TEXTS:

*Utts, Jessica M., Seeing through Statistics 4th ed., Cengage, 2015.

bg 03/26/2019