CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA

ACADEMIC SENATE

GENERAL EDUCATION COMMITTEE

REPORT TO

THE ACADEMIC SENATE

GE-124-156

STA 1300 – Biostatistics (GE Area B4)

General Education Committee	**Date: 05/18/2016**
Executive Committee Received and Forwarded	**Date: 10/19/2016**
Academic Senate	**Date: 10/26/2016 First Reading 11/19/16 Second Reading**

BACKGROUND:

This is a new course seeking GE status. It is going to be taught as a 3-unit lecture course under the semester system.

RESOURCES CONSULTED:
Faculty
Department Chairs
Associate Deans
Deans
Office of Academic Programs

DISCUSSION:

The GE Committee reviewed the ECO for this course and found it to satisfy the GE SLO's and other requirements of GE Area B4

RECOMMENDATION:

The GE Committee recommends approval of GE-124-156, STA 1300 – Biostatistics, for GE Area B4.

STA - 1300 - Biostatistics

C. Course - New General Education* Updated

General Catalog Information

Department*	**Mathematics and Statistics**
Semester Subject Area*	**STA**
Semester Catalog Number*	1300
Quarter Subject Area	
Quarter Catalog Number	
Course Title*	Biostatistics
Units*	**(3)**
C/S Classification *	**C-02 (Lecture Discussion)**

To view C/S Classification Long Description click:
http://www.cpp.edu/~academic-programs/scheduling/Documents/Curriculum%20Guide/Appendix_C_CS_Classification.pdf

Component*	**Lecture**

Instruction Mode*	**Face-to-Face**
Grading Basis*	**Graded Only**
Repeat Basis*	**May be taken only once**
If it may be taken multiple times, limit on number of enrollments	**1**
Cross Listed Course Subject Area and Catalog Nbr (if offered with another department)	
Dual Listed Course Subject Area and Catalog number (If offered as lower/upper division or ugrd/grad)	
Choose appropriate type (s) of course(s)*	☐ Major Course ☑ Service Course ☑ GE Course ☐ None of the above
General Education Area / Subarea*	**B4**

To view the General Education SubArea definitions, click http://www.cpp.edu/~academic- programs/scheduling/Documents/Ch.3-GeneralEducationProposals.pdf.

I. Catalog Description

Catalog Description	Basic definitions, Sampling methods, Graphical display and descriptive statistics. Probability concepts, Normal distribution. Estimation, hypothesis testing, t-tests, goodness of fit, analysis of variance, regression and correlation, and nonparametric procedures. Applications in biological, agricultural, and other applied science. Use of computer packages for applied problems.

II. Required Coursework and Background

Prerequisite(s)

Student must have either achieved a minimum placement score on the appropriate MDPT; or C or better in MAT 0120, or MAT 1050, or MAT 1060, or MAT 1200, or MAT 1250, or MAT 1910; or must have earned 50 or better on the ELM; or, must have earned either 1600 or better on the SAT or 23 or better on the ACT.

Corequisite(s)

Pre or Corequisite(s)

Concurrent

III. Expected Outcomes

List the knowledge, skills, or abilities which students should possess upon completing the course.*

Upon successful completion of this course,

Students will become familiar with fundamentals of biostatistics and statistical methods commonly used in biological, agricultural, and other applied science.
Students will be able to apply various techniques in data analysis (including computational and graphical approaches) and interpret and describe the results using accurate statistical vocabulary.
Students will be able to read and understand research in related fields.

If this is a course for the major, describe how these outcomes relate to the mission, goals and objectives of the major program.

Explain how the course meets the description of the GE SubArea (s). Please select appropriate outcomes according to the GE Area/SLO mapping.

The course description for subarea B4 is:

Courses in this area will require the student to use basic mathematical skills to develop mathematical reasoning, investigative and problem solving abilities, including applications from/to real life situations. Courses in this area will have an explicit intermediate algebra prerequisite, and students shall develop skills and understanding beyond the level of intermediate algebra. Students will not only practice computational skills, but will also be able to explain and apply basic mathematical concepts and solve problems using quantitative methods.

The Expected Outcomes for STA 1300 includes outcomes related to basic mathematical skills (SLOs 1, 2) to develop mathematical reasoning (SLOs 1, 2), investigative and problem solving abilities (SLOs 1, 2, 3), including applications from/to real life situations (SLO 3). The prerequisite is as described and the material goes well beyond the level of intermediate algebra. Students will be required to express their answers in complete sentences, with coherent explanations of the problem-solving and interpretations of the mathematics.

Describe how these outcomes relate to the associated GE Learning Outcomes listed below.*

GE Outcome Ia relates to SLO 2 which requires students to be able to interpret and describe results using accurate statistical vocabulary.

GE Outcome Ie relates to SLOs 1, 2 which require students to use proper statistical methods including standard calculations and graphical approaches to reach conclusions.

GE Outcome IIa relates to SLOs 1-3 which require students to use statistical methods to study and analyze data from real-world problems.

GE Outcome IVb relates to SLOs 1-3 which require students to develop statistical skills which promote intellectual growth.

The course outcomes relate to the GE Area B4 SLOs through the following matrix:

	1a)	1e)	2a)	4b)
O1		X	X	X
O2	X	X	X	X
O3			X	X

General Education Outcomes*

- **Ia. Write effectively for various audiences**
- **Ie. Apply and communicate quantitative arguments using equations and graphical representations of data.**
- **IIa. Apply scientific methods and models to draw quantitative and qualitative conclusions about the physical and natural world.**
- **IVb. Demonstrate activities, techniques, or behaviors that promote intellectual or cultural growth.**

To view the mapping, click https://www.cpp.edu/~academic-programs/Documents/GE% 20SLO%20Mapping.pdf

IV. Instructional Materials

Provide bibliography that includes texts that may be used as the primary source for instruction, and other appropriate reference materials to be used in instruction. The reference list should be current, arranged alphabetically by author and the materials should be listed in accepted bibliographic form.

Instructional Materials*

Texts may vary with instructor and over time. Examples of possible texts include:

'The Analysis of Biological Data' by M. Whitlock and D. Schluter

'Biostatistical Analysis' by J.H. Zar

Faculty are encouraged to make all materials accessible. Indicate with an asterisk those items that have had accessibility (ATI/Section 508) reviewed. For more information, http://www.cpp.edu/~accessibility

V. Minimum Student Material

List any materials, supplies, equipment, etc., which students must provide, such as notebooks, computers, internet access, special clothing or uniforms, safety equipment, lockers, sports equipment, etc. Note that materials that require the assessment of a fee may not be included unless the fee has been approved according to University procedures.

Minimum Student Material*

Textbook, writing materials, calculator, and computer access.

VI. Minimum College Facilities

List the university facilities/equipment that will be required in order to offer this class, such as gymnastic equipment, special classroom, technological equipment, laboratories, etc.

Minimum College Facilities*

Classroom, chalkboard/whiteboard, chalk/marker, computer, internet service, computer projection system, software.

VII. Course Outline

Describe specifically what will be included in the course content. This should not be a repetition of the course description but an expansion that provides information on specific material to be included in the class, e.g. lecture topics, skills to be taught, etc. This should not be a week-by-week guide unless all instructors are expected to follow that schedule.

Course Outline*

1. Basic Definitions

Population, sample, parameter, statistics, biostatistics

Descriptive statistics, inferential statistics, sampling error

Types of Data: categorical, discrete, continuous variables

Scales of Data: nominal, ordinal, interval, ratio

2. Sampling Methods, Graphical Display and Descriptive Statistics

Methods of random sampling

Frequency distribution, pie chart, bar chart, histogram

Shapes of data: symmetry, skewness

Measure of central tendency: mean, median, mode

Measure of variability: range, variance, standard deviation

3. Probability Concepts and Normal Distribution

Basic principles of probability

Properties of normal distribution

Standard normal distribution, Z score

4. Estimation and Hypothesis Testing

Sampling distribution and central limit theorem

Null and alternative hypotheses

Type I error, type II error, and power of a test

Significance level, test statistic, and p-value

z-tests for large one- and two-sample(s)

t-tests for small one- and two-sample(s)

5. Analysis of Categorical Data

Contingency table, observed and expected frequencies

Chi-square test

Goodness-of-fit test and independence test

Roscoe & Byar's rule

Yates' continuity correction

6. Analysis of Variance

Comparing several means

Basic definitions and assumptions

ANOVA table and F-test

Completely randomized design, one-way and two-way ANOVA

Fixed effects, random effects, and mixed effects

Multiple comparison tests

Design of Experiments

7. Correlation and Simple Linear Regression

Relationship among variables

Bivariate data and scatter plot

Correlation and linear relationship

Least square method for the best-fitted line

Equation of simple linear regression

F-test and t-test for statistical relationship

8. Nonparametric Procedures

Difference between parametric and nonparametric procedures

Shapiro-Wilks test, Bartlett's test

Wilcoxon signed-rank test, Mann-Whitney test, Wilcoxon paired test, Kruskal-Wallis test

Spearman's rank correlation test

Where possible, lengthy hand calculations will be omitted and replaced with observation of output from software.

VIII. Instructional Methods

Describe the type(s) of method(s) that are required or recommended for the instruction of this course (lectures, demonstrations, etc.). Include any method that is essential to the course, such as the use of particular tools or software.

Instructional Methods*

Lecture, classroom discussion, demonstration of data analysis using statistical software.

IX. Evaluation of Outcomes

Describe the methods to be used to evaluate students' learning, i.e. written exams, term papers, projects, participation, quizzes, attendance, etc.*

Students will be evaluated on the basis of their performance on

Assigned homework
In-class tests, quizzes, final examination
Class project

Describe the meaningful writing assignments to be included.*

All evaluation methods contain written components which require significant writing and feedback is provided throughout the semester to allow for improvement. In particular, the class project contains a large written component requiring significant writing in both prose and mathematical forms.

Discuss how these methods may be used to address the course and program outcomes, as appropriate. Include or attach a matrix to align the evaluation methods to the outcomes.*

The matrix below shows how the stated methods address the course outcomes. The way in which program goals are addressed can be inferred from this matrix and previous.

	M1	M2	M3
O1	X	X	
O2	X	X	X
O3			X

If this is a general education course, discuss how these methods may be used to address the associated GE Learning Outcomes listed below. Include or attach a matrix to align the evaluation methods to the outcomes.*

How the evaluation methods align to the GE outcomes is described through the following matrix:

	M1	M2	M3
Ia	X	X	X
Ie	X	X	X
IIa	X	X	X
IVb	X	X	X

X. This OPTIONAL Section is for describing Course/Department/College specific requirements.

Department/ College Required ECO Information (Optional)