COURSE OUTLINE OF RECORD

Number: BIOL G260  
TITLE: Biostatistics

ORIGINATOR: Travis Vail  
EFF TERM: Fall 2016
FORMERLY KNOWN AS:  
DATE OF OUTLINE/REVIEW: 04-05-2016
CROSS LISTED COURSE:  
TOP NO: 0499.00
CID: 

SEMESTER UNITS: 3.0
HRS LEC: 36.0  
HRS LAB: 54.0  
HRS OTHER: 0.0
CONTACT HRS TOTAL: 90.0
STUDY NON-CONTACT HRS RECOMMENDED: 72.0

CATALOG DESCRIPTION:
Biostatistics introduces students to data analysis and experimental design. This course specifically focuses on the nature, generation, and testing of biological data. Analyses learned include, but are not limited to, one-sample t-test, two-sample t-test (both pooled and unpoole), variance ratio test, 1-way ANOVA, 2-way ANOVA with replication, block design ANOVA, Tukey's test of pairwise comparisons, chi-squared tests, and non-parametric tests.

JUSTIFICATION FOR COURSE:

PREREQUISITES:
- BIOL G180: Cell and Molecular Biology with a minimum grade of c or better
  or
- BIOL G186: Diversity of Organisms with a minimum grade of c or better
  or
- BIOL G182: Zoology with a minimum grade of c or better
  or
- BIOL G210: General Microbiology with a minimum grade of c or better
  and
- MATH G120: Trigonometry
  or
- MATH G170: Precalculus with a minimum grade of c or better
  or
- MATH G180: Calculus 1 with a minimum grade of c or better

COREQUISITES:  
ADVISORIES:  
ASSIGNED DISCIPLINES: Biological sciences

MATERIAL FEE: Yes [ ] No [X] Amount: $0.00
CREDIT STATUS: Noncredit [ ] Credit - Degree Applicable [X] Credit - Not Degree Applicable [ ]
GRADING POLICY: Pass/No Pass [ ] Standard Letter [X] Not Graded [ ] Satisfactory Progress [ ]
OPEN ENTRY/OPEN EXIT: Yes [ ] No [X]
TRANSFER STATUS: CSU Transferable[ ] UC/CSU Transferable[X] Not Transferable[ ]
BASIC SKILLS STATUS: Yes [ ] No [X] LEVELS BELOW TRANSFER: Not Applicable
CALIFORNIA CLASSIFICATION CODES: Y - Not Applicable
NON CREDIT COURSE CATEGORY: Y - Not applicable, Credit Course
OCCUPATIONAL (SAM) CODE:
REPEATABLE ACCORDING TO STATE GUIDELINES: No [X] Yes [ ] NUMBER REPEATS:
REQUIRED FOR DEGREE OR CERTIFICATE: No [X] Yes [ ]

GE AND TRANSFER REQUIREMENTS MET:
CSU GE Area B: Scientific Inquiry and Quantitative Reasoning
    B2 - Life Science
    B4 - Mathematics/Quantitative Thinking
GWC AA - Area E Lifelong Understanding and Self-Development
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COURSE LEVEL STUDENT LEARNING OUTCOME(S) Supported by this course:
1. Compose a scientific paper using the appropriate standards for scientific writing.
2. Design a scientifically sound experiment that generates analyzable data.
3. Analyze any data set encountered using the appropriate statistical analysis.
4. Interpret results of statistical analyses and discuss the implications of such results on the biological system examined.

COURSE OBJECTIVES:
1. Design a scientifically sound experiment that generates analyzable data.
2. Analyze any data set encountered using the appropriate statistical analysis.
3. Interpret results of statistical analyses and discuss the implications of such results on the biological system examined.
4. Compose a scientific paper using the appropriate standards for scientific writing.

COURSE CONTENT:
LECTURE CONTENT:
I. Definition of Biostatistics
II. Describing data types
    Commonly used terms
    Types of data
III. Experimental design
    Scientific method
    Control vs experimental groups
    Isolating variables
    Clinical vs. Observation experiments
    Designing with analysis in mind
IV. Describing data sets
    Frequency distributions
    Measures of center, variation, and relative standing
V. Probability
Addition rule
Multiplication rule

VI. Discrete probability distributions
- Binomial distribution and its parameters
- Poisson distribution and its parameters

V. Normal probability distributions
- Standard normal distribution
- Central Limit Theorem

VI. z-scores and t-scores

VII. One sample hypothesis testing
- Null and alternative hypotheses
- One-sample z tests
- One-sample t tests

VIII. Two-sample hypothesis testing
- Variance ratio hypothesis testing
- Two sample t’ hypothesis testing
- Two sample t hypothesis testing

IX. Correlation and regression

X. Chi-square hypothesis testing
- Test of goodness-of-fit
- Test of independence
- Test of homogeneity

XI. Analysis of Variance
- Why it works.
- Variance ratio test
- 1-way ANOVA
  - Tukey’s test
- 2-way ANOVA with replication
  - Tukey’s test
- 2-way ANOVA without replication (block design)

XII. Non-parametric analyses
- Sign-ratio test
- Wilcoxon signed-rank tests
- Kruskal-Wallis test
Rank Correlation

XIII. Deciding when test hypothesis test is appropriate

LABORATORY CONTENT:

I. Parameters and statistics
II. Use of the summation notation
III. Probability: Poisson and binomial distributions
IV. Probability: normal distribution
V. $z$-scores, $t$-scores, and standard normal distribution
VI. Experimental design
VII. Hypothesis testing
   - Null and alternate hypotheses
   - One-sample $t$ and $z$ tests
   - Variance ratio test
   - Two-sample $t$, $t'$, and $z$ tests
   - One-way ANOVA
     - Fmax test
     - Tukey’s test
   - Two-way ANOVA
     - Randomized block design
     - With replication
       - Fmax test
       - Tukey’s test
   - Chi-square analyses
     - Goodness-of-fit
     - Homogeneity
     - Independence
   - Non-parametrics

METHODS OF INSTRUCTION:

A. Lecture:
B. Lab:

INSTRUCTIONAL TECHNIQUES:

Lecture, hands-on lab work, assigned reading.
COURSE ASSIGNMENTS:

Reading Assignments

Textbook reading (as assigned on the course syllabus), reading of peer-review journal in preparation for experimental design.

Out-of-class Assignments

Student experiment project, problem sets completed at home

Writing Assignments

Scientific paper covering student experiments

METHODS OF STUDENT EVALUATION:

Written Assignments
Essay Examinations
Objective Examinations
Report
Projects (ind/group)
Problem Solving Exercises
Oral Presentations

Demonstration of Critical Thinking:

Application of results of statistical analyses

Required Writing, Problem Solving, Skills Demonstration:

Scientific written and oral reports regarding student-generated experiment, data, and results.

TEXTS, READINGS, AND RESOURCES:

TextBooks:

LIBRARY:

Adequate library resources include: Print Materials
Non-Print Materials
Online Materials
Services

Comments:

An expansion of subscribed scientific journals would help students in preliminary research prior to design of their experiment.

Attachments:

Attached Files