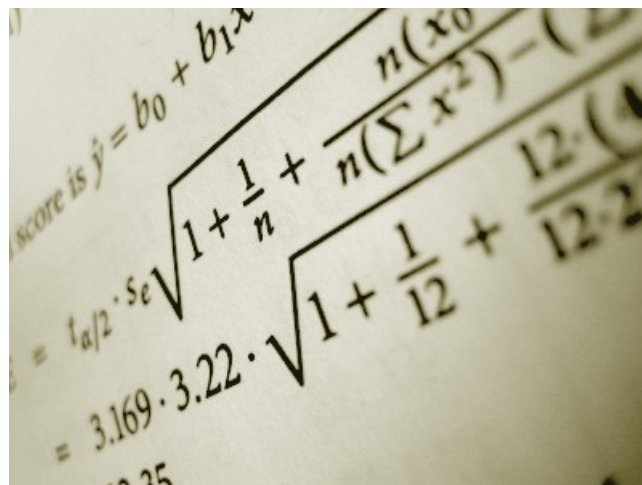


# *Biological Statistics*

*Sierra Nevada College*



*“Empowering students as architects of their own learning.”*

<b>Course Codes &amp; Sections:</b>	MATH 351 – Section 1
<b>Course Title (Credits):</b>	Biological Statistics (3)
<b>Term &amp; Year:</b>	Spring 2016
<b>Course Ref. No. (CRN):</b>	10054
<b>Instructor:</b>	Dr. Steve Ellsworth
<b>Phones:</b>	Office: 775-831-1314 x7457 Cell: 775-742-9480
<b>Email:</b>	<a href="mailto:sellsworth@sierranevada.edu">sellsworth@sierranevada.edu</a>
<b>Office:</b>	TCES 225
<b>Office Hours:</b>	MW 11:00AM-1:00PM, MW 2:30PM-4:00PM, T 12:00PM-3:00PM
<b>Class Meeting Times:</b>	MW 1:00PM-2:15PM
<b>Location:</b>	TCES 204
<b>Required Text:</b>	<i>Biostatistical Analysis</i> Jerrold H. Zar, 5 <sup>th</sup> edition ISBN: 9780131008465
<b>Required Software:</b>	1. <a href="#">Minitab 17</a> 2. Microsoft Excel (preferred) or OpenOffice
<b>Course Moodle Website:</b>	<a href="http://sncmoodle.sierranevada.edu/course/view.php?id=375">http://sncmoodle.sierranevada.edu/course/view.php?id=375</a>

## *Course Description*

Prerequisites: MATH 251. Study of epidemiology and statistics used in all areas of scientific research. Emphasis is on research design, survey techniques, and design of experiments. Introduction to multivariate statistical analysis procedures.

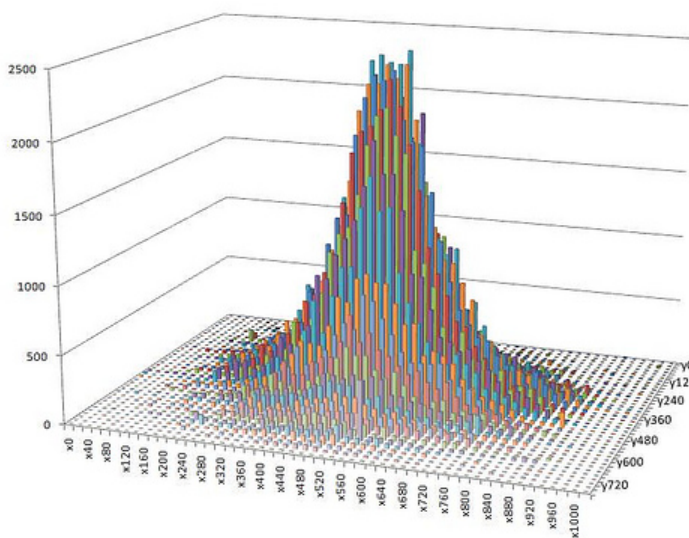
## *Instructional Strategies*

This course is intended to be highly interactive where the instructor and students engage themselves in the process of understanding and interpreting common statistical analyses used in the biological sciences. The class time period will be a combination of lectures, discussion, and work sessions. Students are expected to solve many problems on their own as individuals or in groups. There is an examination of hypothetical and real datasets, comparing both hand calculations from first principles and results calculated from statistical software using computers. Real, published scientific literature will be examined to develop familiarity and confidence with critiquing material from authoritative sources.

## *Student Outcomes*

Students will develop

1. familiarity with the most common and prevalent statistical tests used in the biological sciences (most commonly  $t$ -tests, ANOVA, regression analysis, and chi-square) and confidence in performing these tests;
2. ability to interpret and understand published statistics and figures, and to critically assess their merit;
3. understanding of broad statistical concepts: probability, error rates, the null hypothesis, significance, random vs. fixed effects, power;
4. tools to assess the power (or lack thereof) of a dataset to accept or reject a hypothesis;
5. familiarity with primary literature and confidence to critically assess such work from a statistical standpoint;
6. ability to read and conceptualize statistical tables, to compute simple datasets by hand from first principles and more extensive datasets using statistical software (primarily Minitab);
7. appreciation for the benefits of careful experimental design and planning.



### *Tentative Schedule*

*NOTE – topics, exam date, and any other aspect of the class schedule are subject to change upon notification by instructor. The Course News and Announcements section of the Moodle course website and in-class announcements will be used to alert students of changes to the syllabus.*

#### *Section One*

CLASS DATES	CLASS TOPICS	ZAR CHAPTERS
W 1/20	Introduction, Minitab 17, Types of Data, Populations and Samples	Chapters 1, 2
M 1/25, W 1/27	Measures of Central Tendency, Measures of Dispersion and Variability, The Normal Distribution	Chapters 3,4, 6
M 2/1, W 2/3	One-Sample Hypotheses, Power Analysis	Chapter 7
M 2/8, W 2/10	Two-Sample Hypotheses	Chapter 8
W 2/17	Exam I	

#### *Section Two*

CLASS DATES	CLASS TOPICS	ZAR CHAPTERS
M 2/22, W 2/24	Paired Sample Hypotheses	Chapter 9
M 2/29, W 3/2	One-Way ANOVA, Nonparametric Analysis of Variance, Homogeneity of Variances	Chapter 10
M 3/7, W 3/9	One-Way ANOVA, Nonparametric Analysis of Variance, Homogeneity of Variances, Multiple Comparisons	Chapters 10, 11
M 3/14, W 3/16	Spring break!	
M 3/21, W 3/23	Multiple Comparisons, Exam II	Chapter 11

#### *Section Three*

CLASS DATES	CLASS TOPICS	ZAR CHAPTERS
M 3/28, W 3/30	Two-way ANOVA	Chapter 12
M 4/4, W 4/6	Simple Linear Correlation and Regression	Chapters 17, 19
M 4/11, W 4/13	Comparing Simple Linear Regression Equations	Chapter 18
M 4/18, W 4/20	Multiple Regression and Correlation	Chapter 20
M 4/25, W 4/27	Testing for Goodness of Fit, Contingency Tables	Chapters 22, 23
M 5/2	Exam III	
M 5/9 3:00PM-6:00PM	Final Exam	

## *Methods of Assessing Student Outcomes*

### **Grading:**

- The course is graded on a straight scale: (A 93-100, A- 90-92, B+ 87-89, B 83-86, B- 80-82, C+ 77-79, C 73-76, C- 70-72, D+ 67-69, D 63-66, D- 60-62, F 0-59) unless a shift downward in the scale is appropriate (based on performance of the entire class).
- Your grades on all work will be posted in Moodle. It is your responsibility to check the grades to make sure that there are no errors. Please contact your instructor if there is an incorrect or missing grade.

### **Point summary:**

In-class exams (3 @ 200 pts. each)	600 pts.
Final exam	200 pts.
Course Preparation Assignments (CPAs) and In-Class Activities (Rescaled based on % for entire semester)	100 pts.
General Assignments (Rescaled based on % for entire semester)	100 pts.
TOTAL	1000 points

The rationale for grading assignments is based on a 20 point system (points may be doubled for larger assignments) and consists of the following:

#### 20 points

- ✓ All portions of the assignment are completed
- ✓ It is obvious that a high-quality and in-depth effort was put into the assignment
- ✓ If any answers or computations are incorrect they are not major mistakes or do not hinder understanding of the material
- ✓ Interpretations are relevant and concise, and yet have enough information to convey an understanding of the material
- ✓ It is obvious that no answers were simply copied from another student or group, although answers may be similar from students or groups that work together

#### 15 points

- ✓ All portions of the assignment are completed or possibly only a few very minor components are not completed
- ✓ A quality effort was put into the assignment but it may lack some depth and understanding
- ✓ There are at least one or a few errors that result from a misunderstanding of the material
- ✓ Interpretations are mostly relevant but there may be some lack of understanding of the material
- ✓ It is obvious that no answers were simply copied from another student or group, although answers may be similar from students or groups that work together

10 points

- ✓ The assignment is most likely not completed
- ✓ The effort put into the assignment cannot be described as quality work
- ✓ There are at least several errors that result from a misunderstanding of the material
- ✓ Interpretations are frequently irrelevant and there is often a misunderstanding of the material
- ✓ It is obvious that no answers were simply copied from another student, although answers may be similar from students who work together

5 points

- ✓ The assignment is not completed
- ✓ The effort can be described as minimal and half-hearted
- ✓ There are multiple errors that result in a misunderstanding of the material
- ✓ Interpretations are mostly irrelevant and there is a clear misunderstanding of the material
- ✓ It is obvious that answers were simply copied from another student or group

0 points

- ✓ The assignment was not turned in or basically no real work was put into it.

### ***Course Rules***

- You must bring a laptop with Minitab 17 and Microsoft Excel (or OpenOffice) on it in order to take an exam – it is very important that you accept this responsibility. The exams and homework will require the use these programs, so they are integral aspects of the class. It is absolutely essential that you have access to a computer with Minitab 17 and a spreadsheet program at all times during the course.
- You may use one 8.5x11 sheet of paper with notes, Minitab 17, and a spreadsheet program during the exams. Note sheets from prior exams in the course may also be used. All three note sheets can be used during the final. No photocopies (like from the text) are allowed unless approved by the instructor. During exams no Internet sources other than the course Moodle site may be accessed. Also under no circumstances is it acceptable to share information with other students during exams. Any violation of these rules will result in failing the course.
- There are no make up exams. If arrangements are made with the instructor prior to an exam or an emergency occurs the exam may be skipped and the points from it are added to the total for the final. Exam cannot be skipped for the reason of being unprepared.
- It is ***strongly*** recommended that you take very good notes during class sessions and that you study these notes extensively for the exams. If you need tips on how to take good notes ask your instructor or visit the Office of Academic Services and Instructional Support.
- Laptops ***absolutely*** may not be used in class for personal use such as observing videos, instant messaging, checking e-mail, doing your assignments, or browsing the web. Each violation of this rule may result in the loss of up to 50 points from the overall class score.
- Cell phones may not be used in class unless approved by the instructor. It is best to turn off your phone if you bring it to class.

### ***ADA Accommodations***

In accordance with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, students with a documented disability are eligible for support services and accommodations. If a student wishes to request an accommodation, please contact the Director of Academic Support Services, Henry Conover, at (775) 831-1314 x7534, [hconover@sierranevada.edu](mailto:hconover@sierranevada.edu) or go to the OASIS offices on the third floor of Prim Library within the first week of the semester.

## *The SNC Email System*

The SNC email system is the official communication vehicle among students, faculty members and administrative staff and is designed to protect the confidentiality of student information as required by the Family Educational Rights and Privacy Act of 1974 Act (FERPA). Students should check their college email accounts daily during the school year.

Students have a right to forward their SNC e-mail to another e-mail account (for example, @hotmail or @gmail). However, confidentiality of student information protected by FERPA cannot be guaranteed for SNC e-mail forwarded to an outside vendor. Having email redirected does not absolve a student from the responsibilities associated with official communication sent to his or her SNC email account.

## *Sanctions for Cheating and/or Plagiarism*

### **The Honor Code**

The faculty of SNC believes students must be held to high standards of integrity in all aspects of college life in order to promote the educational mission of the College and to encourage respect for the rights of others. Each student brings to the SNC community unique skills, talents, values and experiences which, when expressed within the community, contribute to the quality of the educational environment and the growth and development of the individual. Students share with members of the faculty, administration and staff the responsibility for creating and maintaining an environment conducive to learning and personal development, where actions are guided by mutual respect, integrity, responsibility and trust. The faculty and students alike must make diligent efforts to ensure high standards are upheld by their colleagues and peers as well as themselves. Therefore faculty and students accept responsibility for maintaining these standards at Sierra Nevada College and are obligated to comply with its regulations and procedures, which they are expected to read and understand.

### **Consequences of Violating the Student Honor Code**

SNC students and faculty share the responsibility for maintaining an environment of academic honesty. Thus, all are responsible for knowing and abiding by the SNC Faculty/Student Honor Code published in the current SNC Catalog. Faculty are responsible for presenting the Honor Code and the consequences of violating it to students at the start of their classes AND for reporting all incidences of academic dishonesty to the Provost. Students are responsible for knowing what constitutes CHEATING, PLAGIARISM and FABRICATION and for refraining from these and other forms of academic dishonesty. Violations of the Honor Code become part of a student's academic record.

- 1<sup>st</sup> Offense: Student receives a zero for assignment/exam and counseling with faculty on the honor code, consequences for violating the honor code, and the value of academic honesty in learning.
- 2<sup>nd</sup> Offense: Student fails course and receives counseling with faculty on the honor code, consequences for violating the honor code, and the value of academic honesty in learning.
- 3<sup>rd</sup> Offense: Student is expelled.

### *The Sierra Nevada College Mission Statement:*

Sierra Nevada College graduates will be educated to be scholars of and contributors to a sustainable world. Sierra Nevada College combines the liberal arts and professional preparedness through an interdisciplinary curriculum that emphasizes entrepreneurial thinking and environmental, social, economic and educational sustainability.

### *The Core Themes:*

Liberal Arts	Professional Preparedness
Entrepreneurial	Thinking Sustainability