



Biology 620 Biostatistics

Lecture: MWF 9:30-10:20 Albertson Hall room 321, 3 cr.

Lab: R 8:30-11:20 Albertson Hall room 321, 1 cr.

Fall 2018

Instructor: Dr. Rob Channell

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Office phone: (785) 628-4214

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University Catalog Description

Statistical concepts with emphasis on measurement and interpretation of biological data and appropriate experimental design. Requisites: PR, MATH 110.

Course Prerequisites

Permission or completion of MATH 110 College Algebra (or equivalent course)

Course Description

This course is designed for students majoring in biology or allied health fields. Its purpose is to introduce students to the experimental design, data organization, and basic statistical analysis. Throughout the course, the scientific method and its application will be stressed. Students will also become familiar with the use of computers in the organization and analysis of biological data.

Contact Policy and Procedures

I want to help students. I encourage students with issues or problems related to the course to talk with me before or after class or email me. If a student is having difficulty with class content, I encourage them to schedule a meeting by using the procedure described below.

Generally, I will respond to emails or attempts to schedule a meeting within 24 hours during the work week and within 48 hours on weekends. During holiday breaks and the summer, I might not be able to respond for considerably longer periods of time.

To schedule a meeting with me please send me an email at RBChannell@FHSU.edu. Recommend 3-4 dates/times that you could meet. I will respond to your request for a meeting - you will receive an email.

Do not attempt to schedule a meeting for a time less than 25 hours in the future.

Course Materials

This course uses Open Educational Resources (OER). There is no required textbook. Course materials are free and will be distributed through the course webpage/Blackboard.

<http://robchannell.org/teaching/biostatistics/index.html>

This course will make use of various forms of technology which will be provided.

Delivery Method and Course Structure

The lecture portion of the course will consist of lectures, problem sets, and simulations. The lab portion this course will consist of tutorials, exercises, simulations, and field experiences. Students might be required to complete tasks or readings prior to attending a specific lecture or lab.

The course is structured in three units (major topic areas). Each unit consists of 5-6 modules (specific concepts or tools). An exam will be scheduled for the end of each unit and will cover all of the modules for that unit.

Course Objectives

At the end of this course, you should be able to:

1. Use the scientific method.
2. Design simple experiments.
3. Characterize samples and populations using descriptive statistics.
4. Solve simple problems involving probabilities.
5. Present the results of numerical analysis.
6. Understand the basics of hypothesis testing techniques.
7. Test assumptions associated with various statistical tests.
8. Select and execute proper statistical analyses for a given situation.
9. Use R to conduct statistical analyses.
10. Describe the basic issues associated with hypothesis testing.
11. Interpret and critique published/presented statistical analyses.
12. Discuss the state of current statistical practice in the life sciences.

Course Schedule

This schedule is subject to change.

Content will change depending on student interest and progress.

Students will be notified of changes through announcements in class or at the Blackboard course site.

Date/Week	Lecture topic
Aug 20/1	Scientific Method
Aug 21	<i>Lab: Basics of R and Graphs</i>
Aug 22	Scientific Method and Vocabulary
Aug 24	Introduction
Aug 27/2	Measures of Central Tendency
Aug 28	<i>Lab: Basics of R and Graphs</i>

Aug 29	Measures of Variability
Aug 31	Measures of Variability
Sept 3/3	Labor Day -- No class
Sept 4	<i>Lab: Group Project Assignment</i>
Sept 5	Probabilities
Sept 7	Probabilities
Sept 10/4	Distributions
Sept 11	<i>Lab: Descriptive Statistics (1st Exam stop)</i>
Sept 12	Presenting Numerical Data
Sept 14	Estimation
Sept 17/5	Hypothesis Testing
Sept 18	Exam 1
Sept 19	Hypothesis Testing
Sept 21	One-sample Hypothesis Testing
Sept 24/6	One-sample Hypothesis Testing
Sept 25	<i>Lab: Group Presentations and Assignment, Testing Assumptions, Estimation</i>
Sept 26	Two-sample Hypothesis Testing
Sept 28	Non-parametric Hypothesis Testing
Oct 1/7	Non-parametric Hypothesis Testing
Oct 2	<i>Lab: One-sample, Two-sample, and Non-parametric Hypothesis Testing</i>
Oct 3	Paired Tests
Oct 5	Paired Tests
Oct 8/8	Paired Tests
Oct 10	<i>Lab: Paired-sample Hypothesis Testing</i>
Oct 11	ANOVA and Kruskal Wallis
Oct 13	ANOVA and Kruskal Wallis
Oct 15/9	Multiple Comparisons
Oct 16	<i>Lab: Critiquing and Interpreting Statistic/ANOVA (2nd Exam stop)</i>
Oct 17	Multiple Comparisons
Oct 19	Decision Tree
Oct 22/10	2-way ANOVA
Oct 23	Exam 2
Oct 24	2-way ANOVA
Oct 26	Experimental Design
Oct 29/11	Experimental Design
Oct 30	<i>Lab: Group Presentation and Assignment, 2-way ANOVA</i>
Oct 31	Linear Regression
Nov 2	Linear Regression
Nov 5/12	Correlation
Nov 6	<i>Lab: Linear Regression and Correlation</i>
Nov 7	Correlation
Nov 9	Goodness of Fit
Nov 12/13	Goodness of Fit/Contingency Tables
Nov 13	<i>Lab: Correlation, Goodness of Fit, and Contingency Tables</i>
Nov 14	Contingency Tables
Nov 16	Decision Tree
Nov 19/14	Fall Break -- No class
Nov 20	Fall Break -- No class
Nov 21	Fall Break -- No class

Nov 23	Fall Break -- No class
Nov 26/15	Statistical Advice (3 rd Exam stop)
Nov 27	Exam 3
Nov 28	Overview of More Advanced Issues
Nov 30	Overview of More Advanced Techniques
Dec 3/16	Group Presentations
Dec 4	<i>Lab: Intermediate Graphics</i>
Dec 5	Group Presentations
Dec 7	Group Presentations
Dec 12	Final exam

Assessment and Grading

Exam 1 - 100 pts	A = 90--100%
Exam 2 - 100 pts	B = 80--89.9%
Exam 3 - 100 pts	C = 70--79.9%
Final exam - 100 pts	D = 60--69.9%
Lab exercises - 100 pts total	F < 60%
Group Project - 100 pts	

Graduate Students: Statistical methods review: 100 pts

Exams will consist of two parts. The first part will focus on concepts and terminology, consist of essay and short answer questions and definition, and will be closed book/notes. The second part will focus on application of lab and analytical techniques, consist of problems similar to lab exercises, and will be open book/notes. The first part of the exam will be 70-90 points and the second part of the exam will be 10-30 points.

The **final exam** is comprehensive, but will focus on the major concepts and ideas of the course and the selection of correct statistical techniques given a particular scenario/setup. The final is essay and short answer.

Lab exercises will be the application of skills learned in lab or analytical techniques presented in lecture to solve problems. Exercises will be 10-20 points and be due the week after they are assigned or at the end of the lab period. Students are encouraged to discuss the solutions to lab exercises, but the work submitted by each student is expected to be the work of that student. Students submitting the same or similar work will be issued a 0 for the assignment. A second offense will result in the students receiving a U for the course. Penalties and enforcement are subject to the university's academic honesty policy.

The **group project** will be original, creative application of concepts discussed in this class. Students will design the project, execute the experimental design (collect data), analyze the data to test a specific hypothesis, and present their

work. The instructions and grading rubric for the project are included with this syllabus.

I will do my best to have all exams and assignments graded and returned to students within 1 week of them being submitted to me. Grades will be recorded and available to students at the BlackBoard course site.

I am happy to correct grading mistakes or errors in recording grades. You must bring the exam or assignment when requesting the correction. However, grades for exams, assignments, or the class are not debatable (i.e. do not ask for/expect your grade to be changed unless an error was made in the calculation of the grade).

Student Help Resources

Students have access to academic services, technical support and student services at Fort Hays State University. You can find the resources online at <http://www.fhsu.edu/ctelt/services/Student-Help-Resources/>

Course policies

Attendance

Students are expected to come to class and to be on time. Attendance will be checked daily. It is recognized that personal emergencies will arise during the course of the semester. If you have a prolonged illness, have someone contact the instructor. Approved absences include verifiable illness, college-approved activity (see note), death of an immediate family member, or field trip for another class.

There is no penalty for arriving late to class – I want you to be in class even if you are late. Students who arrive at class after roll has been taken will need to inform the instructor at the end of **that** class period that they were late and not absent.

Note: Students who miss a class for an approved school sponsored event will not be penalized. If you must miss a class for such an activity, you must supply the instructor with a written explanation containing the date of your absence prior to the day of your absence. If this is not done, you will be counted as absent. Emails or notes to excuse activity participants by the activity sponsor will not be accepted -- it is the student's responsibility.

Make-up Exams and Quizzes, and Late Assignments

Make-up exams are permitted in instances of approved absence (verifiable illness, college-approved activity -- prior notification necessary, death of an immediate family member). If you are going to miss an exam for an approved reason, you must contact the instructor prior to missing the exam (voice mail or

email). Lecture exams must be made up within 1 week. Quizzes cannot be made-up.

Late assignments will not be accepted unless you have an approved absence. If you miss class on a day an assignment is due, it is your responsibility to communicate with the instructor about submitting the assignment in a timely fashion. If you do not communicate with the instructor in a timely fashion, you will receive a 0 for the assignment.

Extra Credit

It is your responsibility to get work done on time in an acceptable form. For this reason, no extra credit will be extended during the course of the semester.

Incomplete Grades

Incomplete grades will not be given except in rare instances when the student's performance has been significantly affected by circumstances beyond the control of the student (death of an immediate family member, hospitalization, etc.). The student needs to meet with the instructor as soon as possible to discuss the possibility of receiving an incomplete. The granting of an incomplete rests solely with the instructor.

Class Participation

Your participation is necessary to maximize what you get out of the class. Feel free to ask pertinent questions at any time. You will be asked questions during class and you are expected to respond.

Use of Technology

During lectures and labs, you are encouraged to use your laptop to take notes (though retention is not as effective as taking them by hand). You can bring phones to class and they can be on, but please keep the ringer on silent. Do not text or make calls during class. You are not allowed to record audio or video in class without specific permission from me. If I believe that you are using technology inappropriately in class, I will revoke your technology privileges - this cannot be debated or appealed.

University Policies

Academic Honesty Policy

Membership in the FHSU learning community imposes upon the student a variety of commitments, obligations and responsibilities. It is the policy of FHSU to impose sanctions on students who misrepresent their academic work. These sanctions will be selected by appropriate classroom instructors or other designated persons consistent with the seriousness of the violation and related considerations... Students participating in any violation of this policy must accept the consequences of their actions. Classroom instructors and/or university review/appeals committees and administrators will assess the

sanctions for violation of this policy. The seriousness of the violation will dictate the severity of the sanction imposed. More information can be found at http://www.fhsu.edu/academic/provost/handbook/ch_2_academic_honesty/

Statement of Accessibility and Services for Students with Disabilities

If you have a disability that may have an impact on your ability to carry out assigned course work and if you wish to seek any accommodations for this course, you must contact Services for Students with Disabilities (SSD). SSD is located in the Kelly Center, Picken Hall, Room 111, 785-628-4401. SSD will review your documentation and determine, with you, what academic accommodations are necessary and appropriate for you that can be accommodated in this course. All information and documentation of your disability is confidential and will not be released by SSD without your written permission. Students can find more information at <http://www.fhsu.edu/disability/get-access/> Instructors who need help to create instructional materials for students with special needs can seek help from the Center for Teaching Excellence and Learning Technologies (CTELT), 785-628-4194.

Use of Computing Resources

Fort Hays State University (FHSU) provides computing resources and worldwide network access to its faculty, staff, and students for legitimate administrative, educational, and research efforts. As a member of the FHSU electronic community it is your responsibility to use computing resources ethically and responsibly. Members of the FHSU electronic community are expected to use computing resources ethically, and to exercise reasonable care in utilization of FHSU information systems or their components. More information related to privacy, responsibilities, things forbidden to do and use of email can be found at http://www.fhsu.edu/academic/provost/handbook/ch_1_computing_resources/

Withdrawal Policy

Students may drop full-semester (16-week) courses through 11:59:59 PM CT on the 28th/29th calendar day of the semester. Students dropping during this time period will not receive any notation on their transcript. Students who withdraw after this period and through 11:59:59 PM CT on the 70th calendar day of the semester will receive a notation on their transcript of withdrawal (W). No withdrawals allowed after the 70th calendar day of the semester. Students who drop/withdraw completely will receive a notation on their transcript of the date dropped/withdrawn. Students receiving financial aid have additional responsibility and should contact the Office of Student Financial Assistance in Picken Hall, 785-628-4408. (<http://www.fhsu.edu/registrar/academic-policies-and-information/>).

Important Dates

September 17 -- Last day to withdraw without transcript record

October 28 -- Last day to withdraw from a course

Notice of Non-discrimination

Fort Hays State University does not discriminate on the basis of gender, race, religion, national origin, color, age, marital status, sexual orientation, disability or veteran status in its educational programs, employment and all other activities. In addition, the university does not discriminate on the basis of a person's genetic information. FHSU is committed to an environment in which students, faculty, administrators, and staff work together in an atmosphere free from all forms of discrimination, harassment, exploitation and intimidation, including, but not limited to, verbal, physical, or written behavior directed toward or relating to an individual or group on the basis of their protected class status.

Individuals who believe they have been discriminated against or harassed on the basis of their protected class status or are victims of sexual harassment should report such acts to the university Equal Employment Opportunity Officer who will assist the grievant in seeking redress through the appropriate procedure. The university's Discrimination and Harassment Complaint Procedure applies to grievances involving students, administrators, faculty or staff. The EEO Officer may be contacted at 600 Park Street, Hays, KS 67601, (785) 628-4033.