Term Information

Effective Term	Autumn 2023
Previous Value	*Summer 2012*

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

Add in one and two-sample problems (incl. proportions) at start of course; remove introduction to generalized linear models (GLM) models from end of course.

What is the rationale for the proposed change(s)?

Resequencing order of 6910, 6950.

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

6801 becomes a co-requisite; 6950 becomes a pre-requisite for 6910.

Is approval of the requrest contingent upon the approval of other course or curricular program request? Yes

Please identify the pending request and explain its relationship to the proposed changes(s) for this course (e.g. cross listed courses, new or revised program)

This course change is part of a revision in the Ph.D. and M.S. programs in Statistics. This will also affect the content of courses taught in the interdisciplinary Ph.D. program in Biostatistics.

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area	Statistics
Fiscal Unit/Academic Org	Statistics - D0694
College/Academic Group	Arts and Sciences
Level/Career	Graduate
Course Number/Catalog	6950
Course Title	Applied Statistics I
Previous Value	*Applied Statistics II*
Transcript Abbreviation	Appl Statist 1
Previous Value	*Appl Statist 2*
Course Description	One and two-sample problems, exploratory data analysis, simple and multiple linear regression, diagnostics and model selection. Intended primarily for students in the PhD program in Statistics or Biostatistics.
Previous Value	*Simple and multiple linear regression, diagnostics, model selection, the mixed model, and generalized linear models. Intended primarily for students in the PhD program in Statistics or Biostatistics.*
Semester Credit Hours/Units	Fixed: 4

Offering Information

Length Of Course	14 Week, 12 Week, 8 Week, 7 Week, 6 Week, 4 Week
Previous Value	*14 Week, 12 Week, 8 Week, 7 Week, 6 Week*
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade

Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	Coreq: STAT 6801 or permission of instructor.
Previous Value	*Prereq: 6801 (620) and 6910 (641), or permission of instructor.*
Exclusions	Not open to students with credit for STAT 6450.
Previous Value	Not open to students with credit for 6450 (645).
Electronically Enforced	No

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	27.0501
Subsidy Level	Doctoral Course
Intended Rank	Masters, Doctoral

Requirement/Elective Designation

Required for this unit's degrees, majors, and/or minors
The course is an elective (for this or other units) or is a service course for other units

Previous Value

Required for this unit's degrees, majors, and/or minors

Course Details

Course goals or learning objectives/outcomes

- Identify and implement appropriate methods of data analysis in the one- and two-sample problem settings.
- Use exploratory analysis to guide regression modeling
- Fit, interpret and perform inference on linear regression models
- Model checking and case-influence analysis
- Modeling with nonconstant variance functions
- Modeling with many predictors
- Summarize an analysis appropriately

Previous Value

Content Topic List

- One and two-sample problems
- One and two-sample proportions
- EDA, statistical models
- Simple linear regression
- Testing, model validation, diagnostics, transformations
- Multiple linear regression
- Inference, F-tests, multiple comparisions
- Categorical predictors
- Variance functions and weighted least-squares
- Diagnostics, case analysis, polynomial regression
- Model comparison
- Variable selection

Previous Value

- *Simple linear regression*
- *Fitting the simple linear regression model*
- *Statistical inference for regression*
- *Diagnostics*
- *Multiple linear regression*
- *Model building and model selection*
- *Iteratively reweighted least squares*
- *Robust regression*
- *Mixed effects regression*
- *The generalized linear model*

Sought Concurrence

No

Attachments

- STAT6950_syllabus.pdf: Syllabus

  (Syllabus. Owner: Craigmile,Peter F)

- sp22-stat-6950-hans.pdf: Old syllabus

  (Syllabus. Owner: Craigmile,Peter F)

Comments

- Please upload the "old" (current) syllabus as well. *(by Vankeerbergen,Bernadette Chantal on 12/03/2022 09:11 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Craigmile,Peter F	12/02/2022 08:29 AM	Submitted for Approval
Approved	Craigmile,Peter F	12/02/2022 05:26 PM	Unit Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	12/03/2022 09:12 PM	College Approval
Submitted	Craigmile,Peter F	12/03/2022 09:25 PM	Submitted for Approval
Approved	Craigmile,Peter F	12/03/2022 09:25 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	12/04/2022 05:40 PM	College Approval
Pending Approval	Cody,Emily Kathryn Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	12/04/2022 05:40 PM	ASCCAO Approval

SYLLABUS: STAT 6950

Applied Statistics I
Autumn 2023 (full semester)
4 credit hours

COURSE OVERVIEW

Instructor

<NAME TO BE ANNOUNCED>

Email address: <TO BE ANNOUNCED>

Lectures: Tuesdays and Thursdays 110 min lectures. <TIMES TBA>
<LOCATION TO BE ANNOUNCED>

Office hours: <TO BE ANNOUNCED>

Graduate teaching assistant

<NAME>

Email address: <TO BE ANNOUNCED>

Office hours: <TO BE ANNOUNCED>

Prerequisites

Statistics 6801 (co-requisite), or permission of the instructor. Not open to students who have taken Statistics 6450.

Course description

One and two-sample problems, exploratory data analysis, simple and multiple linear regression, diagnostics and model selection. Intended primarily for students in the PhD program in Statistics or Biostatistics.

Stat 6950 is an applied statistics course that emphasizes principles of data analysis in the linear model setting. While the focus is applied, the methods of data analysis are presented and motivated in the context of statistical theory at a level appropriate for first year graduate

students in Statistics or Biostatistics. The theoretical background assumes facility with multivariable calculus

and basic matrix operations from linear algebra. The R language and environment for statistical computing and graphics will be used as the main tool for data analysis.

Course learning outcomes

By the end of this course, students should successfully be able to:

- identify and implement appropriate methods of data analysis in the one- and two-sample problem settings;
- use an exploratory analysis of data to guide the linear regression modeling process;
- fit, interpret, and perform statistical inference based on linear regression models;
- use appropriate diagnostics for model checking and case-influence analysis to identify deficiencies with a fitted model;
- recognize and employ appropriate modeling strategies for common examples of nonconstant variance functions;
- employ appropriate strategies for regression modeling with many predictors;
- summarize an analysis appropriately.

COURSE MATERIALS AND TECHNOLOGIES

Textbooks

Required

- S. Weisberg (2014), Applied Linear Regression, 4th Edition, John Wiley & Sons, Inc., NJ.

  An electronic version of the book can be accessed for free through The Ohio State University Libraries at https://library.ohio-state.edu/record=b8665795~S7. You will need to click on “Connect to resource EBSCOhost”; you may also need to supply your OSU credentials. The online resource is best suited for screen reading; each individual is allowed to print/e-mail/save/download a limited number of pages.

Errata and more information about the textbook can be found at http://users.stat.umn.edu/~sandy/alr4ed/.

Recommended/optional

- I will highlight other useful resources as the course progresses.

Necessary Software and Equipment

- This class requires you to use the statistical software packages called R (The R Project for Statistical Computing; http://www.r-project.org/) and RStudio (https://posit.co/). These software packages are available as Free Software with versions compatible with current macOS and Windows operating systems. More details will be given in lectures.
- Access to a computer capable of running the required software, which typically includes Mac and PC devices running the current macOS or Windows operating system.

GRADING AND FACULTY RESPONSE

ASSIGNMENT CATEGORY	PERCENTAGE
Homework	**20**
Midterm 1	**10**
Midterm 2	**20**
Project	**20**
Final Exam	**30**
Total	**100**

Homework will be assigned approximately weekly, with a few weeks off during the semester. There will be fewer homework assignments near the end of the semester when you are working on the project. While adjustments may need to be made, I expect that homework assignments will be due on Carmen on Thursdays by 11:59pm. Instructions for how to prepare and turn in your homework solutions will be given at the beginning of the semester.

Project: A group project will be due on November 21. The project will tie together the concepts learned throughout the course. Details will be provided in the beginning of October.

Exams: The first midterm is **tentatively** scheduled to be on **Tuesday, October 10** during our regularly scheduled class time. The second midterm is **tentatively** scheduled to be on **Tuesday, October 31** during our regularly scheduled class time. The first midterm will last for one hour, and the second midterm will last for 1 hour and 45 minutes. The final exam has been scheduled by the registrar for **<TO BE ANNOUNCED>**

All exams are closed book/closed notes. Further details will be given in advance of each exam. A basic calculator is allowed.

Late assignments

<Policy will be added when the course is offered>

Instructor feedback and response time

<Policy will be added when the course is offered>

COURSE SCHEDULE

Refer to the Carmen course for up-to-date assignment due dates.

Week	Dates	Topics	Reading	Homework
1	Aug 22 Aug 24	One and two-sample problems	Course Notes	
2	Aug 29 Aug 31	One and two-sample proportions	Course Notes	
3	Sep 5 Sep 7	EDA, statistical models, simple linear regression intro	ALR 1.1-1.6	HW1 Due
4	Sep 12 Sep 14	Simple linear regression	ALR 2.1-2.5	HW2 Due
5	Sep 19 Sep 21	Testing, techniques for model validation	ALR 2.6-2.8, 4.5.1	HW3 Due
6	Sep 26 Sep 28	Regression diagnostics, transformations	ALR 8.1, 8.3, 9.1.1,9.2-9.4	HW4 Due
7	Oct 3 Oct 5	Multiple linear regression intro and inference	ALR 3.1-3.5, 4.1.1-4.1.3, 4.2-4.4	HW5 Due
8	Oct 10	Midterm 1 (1hr) Multicollinearity	ALR 4.1.4-4.1.5, 4.5	
9	Oct 17 Oct 19	Transformations, F-tests, multiple comparisons, Regression with categorical predictors	4.1.6-4.1.7, 8.2, 8.4, 5.1-5.2, 6.1-6.3,6.5-6.6	
10	Oct 24 Oct 26	Variance functions and WLS	7.1-7.3, 7.5-7.7	HW6 Due
11	Oct 31 Nov 2	Midterm 2 (2hrs) MLR diagnostics	9.1,9.5-9.6	
12	Nov 7 Nov 9	Case analysis, Polynomial regression	5.3, Course Notes	

Week	Dates	Topics	Reading	Homework
13	Nov 14 Nov 16	Case study, model comparison	10.1-10.3	HW7 Due
14	Nov 21		Course Notes	Project Due
15	Nov 28 Nov 30	Model comparison and variable selection	Course Notes	HW8 Due

OTHER COURSE POLICIES

Academic integrity policy

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct **http://studentlife.osu.edu/csc/**.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.
If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.
Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct web page (go.osu.edu/coam)
- Ten Suggestions for Preserving Academic Integrity (go.osu.edu/ten-suggestions)

Copyright for instructional materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on Title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu

Commitment to a diverse and inclusive learning environment

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Land Acknowledgement

We would like to acknowledge the land that The Ohio State University occupies is the ancestral and contemporary territory of the Shawnee, Potawatomi, Delaware, Miami, Peoria, Seneca, Wyandotte, Ojibwe and Cherokee peoples. Specifically, the university resides on land ceded in the 1795 Treaty of Greeneville and the forced removal of tribes through the Indian Removal Act of 1830. I/We want to honor the resiliency of these tribal nations and recognize the historical contexts that has and continues to affect the Indigenous peoples of this land.

More information on OSU's land acknowledgement can be found at https://mcc.osu.edu/about-us/land-acknowledgement

Your mental health

As a student you may experience a range of issues that can cause barriers to learn, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292--5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614--292--5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Requesting accommodations

The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. **SLDS contact information:** slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This course requires use of CarmenCanvas (Ohio State's learning management system) and other communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- Canvas accessibility (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- CarmenZoom accessibility (go.osu.edu/zoom-accessibility)
- Collaborative course tools

THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

SYLLABUS: STAT 6950
APPLIED STATISTICS II
SPRING 2022

Course overview

Instructor

Instructor: Christopher Hans
Email address: hans.11@osu.edu
Class website: Carmen
Lectures: Tuesdays and Thursdays, 9:05am–10:55am
Classroom: DL 305

Office hours: Tuesdays 11:15am–12:15pm
Wednesdays 2:30pm–3:30pm
Office hours location: CH 428D & Zoom (see Carmen for link)

Grader

Rui Zhang (zhang.9473@osu.edu)

Course description

Simple and multiple linear regression, diagnostics, model selection, the mixed model, and generalized linear models. Intended primarily for students in the PhD program in Statistics or Biostatistics.

Stat 6950 is an applied statistics course that emphasizes principles of data analysis in the linear model setting. While the focus is applied, the methods of data analysis are presented and motivated in the context of statistical theory at a level appropriate for first year graduate students in Statistics. The theoretical background assumes facility with multivariable calculus

and basic matrix operations from linear algebra. The R language and environment for statistical computing and graphics will be used as the main tool for data analysis.

Prereq: 6801 and 6910, or permission of the instructor. Not open to students who have taken 6450.

Course learning outcomes

By the end of this course, students should be able to successfully:

- use an exploratory analysis of data to guide the linear regression modeling process.
- fit, interpret, and perform statistical inference based on linear regression models.
- use appropriate diagnostics for model checking and case-influence analysis to identify deficiencies with a fitted model.
- recognize and employ appropriate modeling strategies for common examples of nonconstant variance functions.
- employ appropriate strategies for regression modeling with many predictors.
- perform basic logistic and Poisson regression analyses.

Course materials

Required

S. Weisberg (2014), Applied Linear Regression, 4th Edition, John Wiley & Sons, Inc., NJ.

An electronic version of the book can be accessed for free through The Ohio State University Libraries at https://library.ohio-state.edu/record=b8665795~S7. You will need to click on "Connect to resource EBSCOhost"; you may also need to supply your OSU credentials. The online resource is best suited for screen reading; each individual is allowed to print/e-mail/save/download a limited number of pages.

Errata and more information about the textbook can be found at http://users.stat.umn.edu/~sandy/alr4ed/.

I will highlight other useful resources as the course progresses.

Course technology

Necessary software

- This class requires you to use the statistical software package called R (The R Project for Statistical Computing; http://www.r-project.org/). This software package is available as Free Software.
    - You can download R for Windows, Mac, and Linux, from the CRAN archive at https://cran.r-project.org.

    - An in-depth introduction to R is available at http://cran.r-project.org/doc/manuals/R-intro.pdf
- An easy-to-use interface to R is available in the software package RStudio. This package is available for Windows, Mac, and Linux and can be downloaded for free from http://rstudio.org. **Note that RStudio requires R to be installed.**
- You may choose to use the (free) R Markdown authoring framework to complete assignments. Information about R Markdown will be provided in class; an online guide with overview information can be found at https://rmarkdown.rstudio.com.

Grading and faculty response

Grades

Assignment or category	Percentage
Homework	**20**
Midterm	**30**
Project	**20**
Final Exam	**30**
Total	**100**

Homework will be assigned approximately weekly, with a few weeks off during the semester. There will be fewer homework assignments near the end of the semester when you are working on the project. While adjustments may need to be made, I expect that homework assignments will be due on Carmen on Thursdays by 11:59pm. Instructions for how to prepare and turn in you homework solutions will be given at the beginning of the semester.

Project: A group project will be due near the end of the semester. The project will tie together the concepts learned throughout the course. Details will be provided in the beginning of March.

Exams: The midterm is **tentatively** scheduled to be on **Thursday, March 3rd** during our regularly scheduled class time. The final exam has been scheduled by the registrar for **Monday, May 2nd** from **8:00am–9:45am**.

All exams are closed book/closed notes. Further details will be given in advance of each exam. A basic calculator is allowed.

Other course policies

Academic integrity policy

Policies for this course

- **Exams**: You must complete the midterm and final exams on your own without assistance from anyone other than a course instructor.
- **Homework**: You may work together on the homework, but do not copy any part of your solutions from another person or another source. While study groups are allowed, remember that you must produce your own, original work. If you're unsure about a particular situation, please feel free to ask ahead of time.
- **Reusing past work**: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.

Ohio State's academic integrity policy

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Statement on title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at titleix@osu.edu

Accessibility accommodations for students with disabilities

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Accessibility of course technology

This course requires use of Carmen (Ohio State's learning management system). If you need additional services to use these technologies, please request accommodations with your instructor (Carmen (Canvas) accessibility).

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614- 292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273- TALK or at suicidepreventionlifeline.org

Disclaimer

This syllabus should be taken as a fairly reliable guide for the course content. However, you cannot claim any rights from it, and we reserve the right to change due dates or the methods of grading and/or assessment if necessary. Any changes will be communicated to you through official course announcements.

Course schedule (tentative)

The following tentative course schedule is subject to change.

Week	Dates	Topics, Readings, Assignments, Deadlines
1	Jan 11, 13	EDA, statistical models, simple linear regression intro
2	Jan 18, 20	Simple linear regression
3	Jan 25, 27	Testing, techniques for model validation
4	Feb 1, 3	Regression diagnostics, transformations
5	Feb 8, 10	Multiple linear regression intro
6	Feb 15, 17	Multiple linear regression inference and diagnostics
7	Feb 22, 24	Multicollinearity, weighted least squares
8	Mar 1, 3	General linear F test, polynomial regression
9	Mar 8, 10	Regression with categorical predictors
10	Mar 15, 17	Spring break
11	Mar 22, 24	Variable selection and model comparison
12	Mar 29, 31	Logistic regression, deviance, and testing
13	Apr 5, 7	Binomial regression, residuals, and diagnostics
14	Apr 12, 14	Poisson regression
15	Apr 19, 21	Variance functions and mixed models