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# ST 518 Course Syllabus

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## ST 518 – Applied Statistical Methods II

### Section 601

Fall 2022

3 Credit Hours

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### Course Description

This second course in statistics for graduate students is intended to further expand students' background in the statistical methods that will assist them in the analysis of data. Course covers many fundamental analysis methods currently used to analyze a wide array of data, mostly arising from designed experiments. Topics include multiple regression models, factorial effects models, general linear models, mixed effect models, logistic regression analysis, and basic repeated measures analysis. This is a calculus-based course. Statistical software is used, however, there is no lab associated with the course. Credit not given for this course and ST 512 or ST 514 or ST 516.

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### Learning Outcomes

This is an applied course that introduces linear models with factorial effects used to analyze data from designed experiments and regression models to analyze data from observational studies. Experimental design is also covered, with an introduction to complete block, latin square, crossed and nested factorial designs and split-plots. Many examples are taken from the life sciences.

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### Course Structure

Students in this course do not attend a typical class period. Instead students will receive course content through online presentations, readings and activities. Students should set aside sufficient time in their schedules to complete these materials.

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### Instructors

**Dr Dan Harris** (doharris) - *Instructor*

**Email:** [doharris@ncsu.edu](mailto:doharris@ncsu.edu)

**Phone:** 919-515-1924

**Office Location:** SAS Hall 5118

**Office Hours:** 1:00pm-2:00pm ET M noon-1:00pm ET W or by appointment

**Xuan Liu** (xliu65) - *Teaching Assistant*

**Email:** [xliu65@ncsu.edu](mailto:xliu65@ncsu.edu)

**Phone:** NA

**Office Location:** SAS Hall

**Office Hours:** by appointment

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### Course Meetings

#### Problem Session

**Days:** H

**Time:** 5:45pm - 6:45pm

**Campus:** Main

**Location:** Zoom

*This meeting is optional.*

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#### Problem Session

**Days:** T

**Time:** 5:45pm - 6:45pm

**Campus:** Main  
**Location:** Zoom  
*This meeting is optional.*

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## Meeting Notes

This is an on-line course, so there are no official class meetings. We will hold weekly problem sessions via Zoom; attendance is optional and sessions will be recorded and available for asynchronous viewing.

Exams: All exams are closed book. For the midterm exams, students may use one 8 1/2 X 11 page of notes (front and back). For the final exam, students may use two 8 1/2 X 11 pages of notes (front and back). Calculators may be used on exams. Students may take the exam on any of the three days listed in the course outline below. The midterm exams are limited to one hour. The final exam is limited to two hours.

Exam proctoring: Students must arrange to take their exams during the assigned exam window. Students may take exams in their choice of two possible methods. Through the Distance Education Proctoring Offices.

- Students who are in Wake and adjoining counties may arrange to take their exams at the DE Proctoring offices by appointment. **To schedule your appointment, visit <https://testing-services.delta.ncsu.edu/on-campus-make-an-appointment/>.** When you go to take the exam, you will need to be prepared. Bring a photo ID, know your UnityID, and if you are a DUO user, bring your registered device.
  - Off campus proctoring. Students who are not in Wake County or the adjoining counties or have extenuating circumstances may take exams through an approved proctor. All remote proctoring should be arranged through the Distance Education Proctoring Office. To use a remote proctor for an exam, you must submit an online request and it must be approved by DELTA Testing Services. Submit your request at least 7 days before your exam window. Most exam material is sent 2 - 5 business days before the exam window. For more information on arranging proctors see <https://testing-services.delta.ncsu.edu/testing-services-remote/>.
  - Regardless of the location, students should plan their exam location well in advance and verify arrangements at least one week in advance of the exam.
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## Course Materials

### Textbooks

**An Introduction to Statistical Methods and Data Analysis** - Ott and Longnecker

**Edition:** 7th

**ISBN:** 978-1-305-46552-7

**Cost:** approximately \$40 ebook

*This textbook is required.*

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### Expenses

None.

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### Materials

None.

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## Requisites and Restrictions

### Prerequisites

St 517 or equivalent

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### Co-requisites

None.

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## Restrictions

None.

## Transportation

This course will not require students to provide their own transportation.

## Safety & Risk Assumptions

None.

## Grading

### Grade Components

Component	Weight	Details
<b>Homework</b>	<b>20</b>	Weekly homework due on Sunday (weeks without exams).
<b>Forum</b>	<b>5</b>	Each week a few questions will be posted for discussion. You may use the forum to ask questions, explore ideas and create community with your classmates. The forums will be graded on participation and engagement.
<b>Midterm Exam 1</b>	<b>20</b>	Proctored exam. Closed book, closed notes with one 8.5"x11" formula sheet and calculator permitted.
<b>Midterm Exam 2</b>	<b>20</b>	Proctored exam. Closed book, closed notes with one 8.5"x11" formula sheet and calculator permitted.
<b>Final Exam (not comprehensive)</b>	<b>20</b>	Proctored exam. Closed book, closed notes with one 8.5"x11" formula sheets and calculator permitted.
<b>Group Project</b>	<b>15</b>	The group project will be assigned during Week 11 of the course and will be due at the end of the last week classes (Week 15). The project will be a simulated design and analysis of an experiment to identify the significant effects on a response variable, as well as fitting a model to estimate the settings of the significant factors to achieve a desired response value.

## Letter Grades

### This Course uses Standard NCSU Letter Grading:

97 ≤ **A+** ≤ 100

93 ≤ **A** < 97

90 ≤ **A-** < 93

87 ≤ **B+** < 90

83 ≤ **B** < 87

80 ≤ **B-** < 83

77 ≤ **C+** < 80

73 ≤ **C** < 77

70 ≤ **C-** < 73

67 ≤ **D+** < 70

63 ≤ **D** < 67

60 ≤ **D-** < 63

0 ≤ **F** < 60

## Requirements for Credit-Only (S/U) Grading

Performance in research, seminar and independent study types of courses (6xx and 8xx) is evaluated as either "S" (Satisfactory) or "U" (Unsatisfactory), and these grades are not used in computing the grade point average. For credit only courses (S/U) the requirements necessary to obtain the grade of "S" must be clearly outlined.

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## Requirements for Auditors (AU)

Information about and requirements for auditing a course can be found at <http://policies.ncsu.edu/regulation/reg-02-20-04>.

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## Policies on Incomplete Grades

If an extended deadline is not authorized by the Graduate School, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) by the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at <http://policies.ncsu.edu/regulation/reg-02-50-03>. Additional information relative to incomplete grades for graduate students can be found in the Graduate Administrative Handbook in Section 3.17.G at <http://www.ncsu.edu/grad/handbook/index.php>

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## Late Assignments

By policy, no late assignments will be accepted. The instructor may make exceptions to this policy at his discretion if student provides a good reason at least 48 hours prior to the due date/time.

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## Attendance Policy

For complete attendance and excused absence policies, please see <http://policies.ncsu.edu/regulation/reg-02-20-03>

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### Attendance Policy

None.

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### Absences Policy

None.

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### Makeup Work Policy

By policy, there will be no make-up work permitted. The instructor may at his discretion permit make-up work if the student provides a good reason for the need to miss an assignment at least 48 hours prior to the due date/time.

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### Additional Excuses Policy

None.

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## Academic Integrity

### Academic Integrity

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at <http://policies.ncsu.edu/policy/pol-11-35-01>

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### Honor Pledge

Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

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## Digital Course Components

Students may be required to disclose personally identifiable information to other students in the course, via digital tools, such as email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

### Digital Course Components:

Moodle  
Panopto  
Zoom

Software: Students in this course will use SAS statistical software. This software is widely used in analysis of research data. This software may be accessed : 1. Students may install the software on their own machine for free. For information on obtaining SAS for your own machine see <https://software.ncsu.edu/campus/sas/> 2. Students may also use SAS on the Virtual Computing Laboratory (VCL). Machines in the VCL are assigned on a reservation basis and may fill up. Students should plan accordingly to insure assignments are completed on time. There is no cost for using the VCL. For more information see <http://vcl.ncsu.edu/> 3. Students who are on campus can use SAS at a variety of campus laboratories.

## Accommodations for Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resource Office at Holmes Hall, Suite 304, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01) (<https://policies.ncsu.edu/regulation/reg-02-20-01/>).

## Non-Discrimination Policy

NC State provides equal opportunity and affirmative action efforts, and prohibits all forms of unlawful discrimination, harassment, and retaliation ("Prohibited Conduct") that are based upon a person's race, color, religion, sex (including pregnancy), national origin, age (40 or older), disability, gender identity, genetic information, sexual orientation, or veteran status (individually and collectively, "Protected Status"). Additional information as to each Protected Status is included in NCSU REG 04.25.02 (Discrimination, Harassment and Retaliation Complaint Procedure). NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at <http://policies.ncsu.edu/policy/pol-04-25-05> or <https://oied.ncsu.edu/divweb/>. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

## Course Schedule

**NOTE:** The course schedule is subject to change.

### **Week 1 — 08/22/2022 - 08/28/2022**

Correlation and Simple Linear Regression

### **TBD — Week 2 — 08/29/2022 - 09/04/2022**

Multiple Regression and Variable Selection

### **TBD — Week 3 — 09/05/2022 - 09/11/2022**

Advanced Topics in Multiple Regression: Sums of Squares, Higher Order Terms in Regression, Confidence and Prediction Intervals, Partial Correlation and Influence

### **TBD — Week 4 — 09/12/2022 - 09/18/2022**

Diagnostic Plots, One-Way ANOVA

### **TBD — Week 5 — 09/19/2022 - 09/25/2022**

Lack of Fit

Exam 1: 9/21-9/23

### **TBD — Week 6 — 09/26/2022 - 10/02/2022**

Contrasts, Multiple Comparisons, Power and Sample Size

### **TBD — Week 7 — 10/03/2022 - 10/09/2022**

Two Factor ANOVA

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**TBD – Week 8 – 10/10/2022 - 10/16/2022**

Three Factor ANOVA, Unbalanced Data

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**TBD – Week 9 – 10/17/2022 - 10/23/2022**

Randomized Complete Block Experimental Designs (RCBD), Random Blocking Effects, Latin Squares

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**TBD – Week 10 – 10/24/2022 - 10/30/2022**

ANCOVA

Exam 2: 10/26-10/28

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**TBD – Week 11 – 10/31/2022 - 11/06/2022**

One-Factor Random Effects Models

Project Assigned

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**TBD – Week 12 – 11/07/2022 - 11/13/2022**

Mixed Effects Models, Standard Error, Confidence Intervals for Means

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**TBD – Week 13 – 11/14/2022 - 11/20/2022**

Nested Factors

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**Thanksgiving Week – 11/21/2022 - 11/27/2022**

We will take off the week of Thanksgiving; no new material or assignments due

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**TBD – Week 14 – 11/28/2022 - 12/04/2022**

Split Plot Designs

Last week of classes: Note that the last homework assignment will be due during the last week of class. This notification meets the requirements of REG 02.20.14.

Project due 12/4

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**TBD – Week 15 – 12/05/2022 - 12/11/2022**

Final Exam: 12/7-12/9

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