Syllabus for ST517 - Statistical Methods I

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Prerequisites: Second course in calculus (MA 241 at NCSU)
Co-requisites: None
Restrictive Statement: Credit not given for this course and ST 511 or ST 513 or ST 515. This course does NOT count as an elective towards a degree or a minor in Statistics.

Course Description: Provides students with a background in the statistical methods that assist in the analysis of data, including summarizing and describing data and techniques for inference. Topics include basic probability distributions (e.g. normal, binomial), expected value, estimation (maximum likelihood, confidence intervals), hypothesis testing, and multiple regression 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 511 or ST 513 or ST 515. This course does NOT count as an elective towards a degree or a minor in Statistics.

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

Time commitment: Students should expect to send 3 hours a week just to complete the online lectures and content. Students should also set aside approximately 8-12 hours per week to complete discussion postings and responses and to study on their own in addition to the online content.

Support mechanisms: Since this course is online the instructor will have virtual office hours. Students who cannot attend the posted times may make an appointment via email for other times. Additionally, a general discussion board on the course website will allow students to ask questions of each other.

Communication: Students are expected to check their NCSU email regularly to receive course announcements. Students who do not use their NCSU email should arrange to have this email forwarded to an account they do use. Due to university regulations the instructor can send course announcements only to NCSU email addresses.

By the end of the course, students will be able to:
- Describe similarities and differences between data collection techniques, such as simple random samples, stratified or cluster samples, completely randomized experiments, matched-pairs or block designs.
- Summarize data using appropriate graphical and numerical techniques, including using common probability distributions as models for datasets.
- Calculate expected values, variances, and probabilities for common probability distributions (e.g. normal, binomial).
- Estimate a population parameter by finding the maximum likelihood estimator or calculating the appropriate confidence interval.
- Make inference about a population using an appropriate hypothesis test, confidence interval, or regression model.
- Fit, interpret, and assess regression models with one or more predictors.
Recommended Texts:

- Textbooks may serve as additional resources for students. Students are not required to buy either textbook.

Note Outlines: For each topic, the instructor will provide note outlines that correspond to one or more online lecture presentations. Students are expected to complete these outlines as they view the lectures. Note outlines will be posted to the course Moodle site and will be freely available to students.

Calculator: Students will need a basic calculator that can do addition, subtraction, multiplication, division and square roots. Students are allowed but not required to use a more advanced statistics specific calculator such as a TI-83 or TI-84 calculator.

Software: Students in this course will use statistical software such as SAS and/or R, each of which are widely used in analysis of research data. To access this software:

- Students may install the software on their own machine for free.
  - For information on obtaining SAS for your own machine see sas.ncsu.edu
- Students may also use R or 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/
- Students who are on campus can use SAS or R at a variety of campus laboratories.

Grades: It is the student’s responsibility to be aware of their grades in the course and the appropriate level of work required. Your final grade in this course will depend on the following:

<table>
<thead>
<tr>
<th>Item</th>
<th>Points</th>
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<tbody>
<tr>
<td>Midterm Exam</td>
<td>100</td>
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<tr>
<td>Online Quizzes</td>
<td>100</td>
</tr>
<tr>
<td>Online Discussion Postings</td>
<td>100</td>
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<tr>
<td>Comprehensive Final Exam</td>
<td>200</td>
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<td><strong>Total</strong></td>
<td><strong>500</strong></td>
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This Course uses Standard NCSU Letter Grading. Percentage cutoffs are firm and no rounding occurs.

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A+</td>
<td>97 - 100</td>
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<tr>
<td>A</td>
<td>93 - 97</td>
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<tr>
<td>A-</td>
<td>90 - 93</td>
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<tr>
<td>B+</td>
<td>87 - 90</td>
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<tr>
<td>B</td>
<td>83 - 87</td>
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<tr>
<td>B-</td>
<td>80 - 83</td>
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<tr>
<td>C+</td>
<td>77 - 80</td>
</tr>
<tr>
<td>C</td>
<td>73 - 77</td>
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<tr>
<td>C-</td>
<td>70 - 73</td>
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<tr>
<td>D+</td>
<td>67 - 70</td>
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<td>D</td>
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<td>0 - 60</td>
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Incomplete (IN) grades are given only as specified in university regulations. Students who wish to audit the course with satisfactory status must register officially for the course and will be required to complete all online quizzes.

**Quizzes:** Throughout the semester there will be 12 online quizzes assigned, each worth 10 points. The lowest two quiz scores will be dropped. Students will have one attempt per quiz. These online quizzes will help students insure that they have mastered the material. Each quiz will be tied to course content modules posted to the course website. Students should work through the modules before attempting these quizzes. Quizzes are presented in Moodle and are taken online. There is NO time limit on quizzes. Students may work on a quiz over multiple days and save their answers before submitting a quiz. Some questions will be multiple choice or numeric response; these will be automatically graded. Other questions will require students to upload a written response that will need to be manually graded. Quizzes will generally be due on Fridays each week; see Moodle for specific due dates. No late quizzes will be accepted, and no quizzes will be reopened for any reason.

**Exams:** All exams are closed book. For the midterm exam students may use one 8 ½ X 11 page of notes (front and back). For the final exam, students may use two 8 ½ X 11 pages of notes (front and back). Basic calculators (such as TI-84) may be used on all exams. Students who are unable to attend an exam for a legitimate unavoidable reason may take a make-up exam only if the student provides suitable documentation of the delay and takes the make-up in a timely manner. Students may take the exam on either of the two days listed in the course outline below. The midterm exam is limited to 1.5 hours. The final exam is limited to 3 hours.

**Exam proctoring:** Students must arrange to take their exams during the assigned two day 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 on a walk in basis. For more information see http://distance.ncsu.edu/students/localproctor.html
- 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 For more information on arranging proctors see http://distance.ncsu.edu/students/remoteproctor.html
- 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. Please note that the instructor does not communicate directly with proctors. Please refer all questions regarding proctoring to the distance proctoring center.

**Discussion Board Postings:** Student in this course will be broken into small groups of 3 to 5 students. These groups will answer questions and discuss course content using the online discussion board. These discussion questions will be keyed to the specific week’s material and will have specific due dates (see Moodle). Due dates are firm and your fellow group members will be counting on your contributions to be submitted by the due date. Discussion postings will be graded based on quality of responses. Students are expected to treat each other with respect on the boards; postings that are disrespectful will receive a score of zero.

**Late Work Policy:** No late work will be accepted for any reason. No quiz or discussion posting will be reopened for any reason.

**Accommodations for Disabilities**
Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, student must register with the Disability Services Office (http://www.ncsu.edu/dso), 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 at http://policies.ncsu.edu/regulation/reg-02-20-01.
Non-Discrimination Policy
NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. 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 http://www.ncsu.edu/equal_op/. 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.

Academic Integrity and Honesty
- 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
- See http://policies.ncsu.edu/policy/pol-11-35-01 for a detailed explanation of academic honesty.
- Copying someone else's work and presenting it as your own is plagiarism. Plagiarism, cheating, and other forms of academic dishonesty will not be tolerated. To create a fair and equitable environment, the instructor aggressively enforces the universities policies on academic misconduct. Although working together on written assignments to overcome obstacles is encouraged, each student must compose and write their own analysis and reports. All cases of academic misconduct will be handled as set out in university policies.

N.C. State University Policies, Regulations, and Rules (PRR)
Students are responsible for reviewing the PRRs which pertain to their course rights and responsibilities. These include:
http://oied.ncsu.edu/oied/policies.php (Office for Institutional Equity and Diversity),
http://policies.ncsu.edu/policy/pol-11-35-01 (Code of Student Conduct), and
http://policies.ncsu.edu/regulation/reg-02-50-03 (Grades and Grade Point Average).

Course Outline (Note that the course schedule is subject to change)

Week:
1  Data collection and summary
2-3  Distribution, including discrete vs. continuous random variables, expectation, variance, Binomial, Poisson, Normal, joint distributions, sampling distribution of the mean
4  Estimation via maximum likelihood
5  Confidence intervals for means
6  Hypothesis tests for means
7  Midterm Exam
8-9  Inference for categorical data
10  Spring Break
11  Introduction to regression
12-14  Regression for one or more predictor variables, including inference for regression, variable selection, model fitting and diagnostics
15  Wrap-up and review
16  Final Exam