CLASS INFORMATION
Instructor: Erik Andries
Course: Math 1330/1331
1330: INTRODUCTION TO PROBABILITY AND STATISTICS
1331: INTRODUCTION TO DATA ANALYSIS USING TECHNOLOGY
Location: MJG-110
Office: Westside Building #2, 2nd Floor Faculty Offices
Phone: 224-4000x50244 (not recommended)
Email: eandries@cnm.edu (recommended)
Webpage: w301.cnm.edu/~eandries
Office Hours: Tuesday/Thursday 2:30-3:30pm

COURSE DESCRIPTION
1330: Introduces basic concepts in probability and statistics-single data analysis and descriptive statistics, probability and probability models, sampling and statistical inference-with applications from varied fields.
1331: Expose students to basic data analysis techniques using computer methods to organize data, view and display data graphically for interpretation, to obtain statistics and to find proper tests for the interpretation of sampled data sets. Students learn various statistical diagnostics for analysis and interpretation to make comparisons between data sets. This course is supplemental to the Math 1330 course, which develops a detailed explanation of statistical practices. Graphic and computer methods for organizing and analyzing data utilize the Excel spreadsheet software.

TEXTS/MATERIALS
Textbook: Students will choose one of three options.
Tool(s): Scientific Calculator; Excel
Software Policy: Students will need access to Excel, Word, and PowerPoint to complete course assignments. CNM offers all students free access to Office 365, which includes these programs, through the following link.
PaperCut: PaperCut is an element of the sustainability effort at CNM. Its purpose is to reduce paper usage. Each student has an online account with an allotment of 150 free printer pages per term. If this allotment runs out, additional pages may be purchased by the student (see cnm.edu/papercut)

ATTENDANCE
According to CNM regulations, students enrolled for credit or audit are expected to attend all class sessions. Students who miss the equivalent of 15% of contact time may be dropped from the course by the instructor. But it is ultimately the student’s responsibility to withdraw from the course. Absences from class do not relieve students from responsibility for missed assignments, material covered in class, or exams.

DISABILITY STATEMENT
We will accommodate students with disabilities documented by the CNM Disability Resource Center. These students should inform the instructor of their particular needs during the first two weeks of the semester.

GRADING
Each student will receive two separate grades: one for MATH 1330 and one for MATH 1331.

The grade for MATH 1330 consists of the following:
> Tests: 3 tests worth 100 points. There are no make-ups tests unless a documented excuse from your medical provider is given.
> Homework: Homework will be done online using CONNECT. At the end of the semester, the homework grade will be a percentage: the number of points awarded divided by the total number of possible points times 100.
> Final exam: out of 100 points

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<thead>
<tr>
<th>Procedure</th>
<th>Weight</th>
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<tr>
<td>3 TESTS (1,2,3)*</td>
<td>60%</td>
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<tr>
<td>HOMEWORK VIA CONNECT</td>
<td>15%</td>
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<tr>
<td>FINAL EXAM**</td>
<td>25%</td>
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<tr>
<td>Total</td>
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*There are no make-up exams. If you miss an exam due to medical emergency, you will need to provide documentation on official medical stationery, otherwise you will receive a zero for your test score.
**In the event CNM closes on the day of the final exam, final grades for students will be calculated based on all work assessed up to that point in the course.
Your final grade will be computed as a weighted average
Grade=0.60*T + 0.15*H + 0.25*E
where T is the overall test average (%), H is the homework average (%) and E is the final exam percentage (%).

The grade for MATH 1331 consists as follows:
> Projects: 3 projects.

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<thead>
<tr>
<th>Procedure</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Project 1</td>
<td>20%</td>
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<tr>
<td>Project 2</td>
<td>30%</td>
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<tr>
<td>Project 3</td>
<td>50%</td>
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<tr>
<td>Total</td>
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Your final grade will be computed as a weighted average:
Grade=0.25*P1 + 0.30*P2 + 0.45*P3
where P₁ is the project 1 grade (%), P₂ is the project 2 grade (%) and P₃ is the project 3 grade (%).

<table>
<thead>
<tr>
<th>1330 TENTATIVE SCHEDULE</th>
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<tbody>
<tr>
<td><strong>Week</strong></td>
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</table>
| 1 | 1.1 Sampling  
1.2 Types of Data  
1.3 Design of Experiments  
2.1 Graphical Summaries  
2.2 Frequency Distributions & Graphs |
| 2 | 2.2 Frequency Distributions & Graphs  
3.1 Measures of Center  
3.2 Measures of Spread  
3.3 Measures of Position |
| 3 | Test 1 Review  
Test 1 |
| 4 | 4.1 Correlation  
4.2 Least-Squares Regression Line  
5.1 Basic Concepts of Probability  
5.2 Addition & Compliment Rule |
| 5 | 6.1 Random Variables  
6.2 Binomial Distribution  
7.1 Standard Normal Curve |
| 6 | 7.2 Application of Normal Distribution  
7.3 Sampling Distribution |
| 7 | Test 2 Review  
Test 2 |
| 8 | 8.1 Confidence Intervals with σ known  
8.2 Confidence Intervals with σ unknown |
| 9 | 8.3 Confidence Interval for proportions |
| 10 | 9.1 Basic Principles of Hypothesis Testing  
9.2 Hypothesis Testing (HT) with known σ |
| 11 | 9.3 HT with unknown σ  
9.4 HT for proportions |
| 12 | Test 3 Review  
Test 3 |
| 13 | 11.1 HT for the difference of two means  
11.2 HT for difference between two proportions |
| 14 | 11.3 HT for difference of two means  
Errata |
| 15 | Review  
Final Exam (Last day of class) |

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<thead>
<tr>
<th>1331 TENTATIVE SCHEDULE: (May vary considerably)</th>
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<tbody>
<tr>
<td><strong>Week</strong></td>
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<td>Week #1</td>
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<td>Week #14</td>
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<td>Week #15</td>
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1331 ASSESSMENT

Students will be expected to complete three projects to evaluate their use of spreadsheet software, Microsoft word and Power point. The students will also be evaluated on interpretation of the statistics, graphs and tests of the data projects.

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<thead>
<tr>
<th>PROJECTS &amp; OBJECTIVES</th>
<th>DETAILS</th>
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| **PROJECT ONE (25%):** Understand descriptive statistics; graphs of quantitative variables; understand how to graph qualitative variables and obtain relative frequencies. Students will analyze the PSA (Prostate Specific Antigen) data set. | A. Use the case study on Page 90 of the *Elementary Statistics* book. Have students complete questions (1-9). Graphs and tables must be presented using Excel. Students transfer graphs and tables to a Word document with explanations.  
B. Choose a problem similar to #22 on page 75 to have students graph qualitative data and interpret the information. |
| **PROJECT TWO (30%)**: Understand associations between variables and regression. | The case study on pages 194-195, may be used to have students use Excel to graph scatter diagrams and find the regression equation for the variables. Students should also calculate the correlation coefficient, and use box-plots and histograms to view the data and determine if problems exist in the data sets. (Instructors should have some flexibility on looking at residual plots for assessing issues concerning the regression model.) |
| **FINAL PROJECT (45%)**: Understanding how to put a statistical project together. Understanding testing and confidence intervals. This project utilizes the following: | This is the final project for the class. Students will use all of the methods discussed including calculating confidence intervals and hypothesis testing. Examples:  
1. Medical data set on blood pressure to look at the effects of smokers and non-smokers. (See Example-Final-Project.docx.)  
2. Case studies from the book: |

- a. Regression and R² value (project dependent)  
- b. Confidence intervals  
- c. Hypothesis test with interpretation  
- a) Page 402: looks at data on wood stove pollutants  
- b) Pages 472-473: shows data on temperatures in Washington D.C.
1330 STUDENT LEARNING OUTCOMES

Explain the general concepts of Statistics
- Component 1: Distinguish between descriptive and inferential statistics.
- Component 2: Distinguish between qualitative and quantitative data
- Component 3: Give examples of a population, a sample, a parameter, and a statistic

Presentation and description of data
- Component 1: Present data graphically, using histograms and other types of graphs
- Component 2: Interpret graphs of data, including histograms and shapes of distributions
- Component 3: Calculate and interpret the mean, median, and mode to describe data
- Component 4: Calculate and interpret range, variance, and standard deviation to describe data
- Component 5: Calculate and interpret z-scores that correspond with observations

Analyze data using regression and correlation
- Component 1: Construct and analyze scatter diagrams
- Component 2: Calculate the linear correlation coefficient and use this to decide whether a linear relationship exists between two variables
- Component 3: Find the equation of a least-squares regression line between two variables
- Component 4: Sketch the graph of the least-squares regression line

Present the concepts of probability distributions
- Component 1: Distinguish between discrete and continuous random variables
- Component 2: Construct and interpret a probability distribution
- Component 3: Calculate and interpret the variance, standard deviation, and expected value of the Binomial distribution
- Component 4: Use the area under a probability curve to compute probabilities
- Component 5: Calculate probabilities using the standard normal distribution
- Component 6: Distinguish between a data distribution and a sampling distribution
- Component 7: Identify and use the Central Limit Theorem

Compute point and interval estimates
- Component 1: Estimate the value of a population mean and determine the associated confidence interval for a population mean
- Component 2: Estimate the value of a population proportion and determine the associated confidence interval for a population proportion
- Component 3: Calculate the sample size necessary for an estimate given the desired confidence.
- Component 4: Explain the meaning of the confidence level and margin of error

Perform hypothesis tests
- Component 1: Use the appropriate test (z-test versus a t-test, and one-tailed versus a two-tailed test; mean versus proportion; one-sample versus two-samples) to determine the veracity of a hypothesized claim.
- Component 2: Determine whether data is statistically significant

Component 3: Explain the meaning of significance, the P-value and the significance level
Component 4: Distinguish between Type I and Type II error

1331 STUDENT LEARNING OUTCOMES (SLOs)

1. Know how to use data sets, the variables within the dataset, their data type and how to import data sets between different software packages: Students will be able to know how to apply spreadsheet techniques to qualitative and quantitative datasets, and understand basic sampling methods from populations.

2. Present data in graphically and descriptively using a spreadsheet software package: This means the student will be able to use graphical techniques to present data (e.g., histograms, box-plots), calculate descriptive statistics of datasets (means, standard deviations, medians), and to normalize datasets using the Z-score.

3. Compute models two-variable data using regression using a spreadsheet software package: Students will be able to obtain a regression line of a two-variable dataset, know how to calculate the correlation and r-squared values of a regression function, create scatter diagrams and be able to interpret potential regression functions that model the data. Student will also understand the ideas about residuals and residual plots using the software.

4. Know the concept of probability distributions using software: Students will be able to create probability distributions for discrete data sets and calculate probabilities using the spreadsheet software. Students will be able to understand the difference between sampling, population and data distributions, and understand the Central Limit Theorem.

5. Compute interval estimates for a point estimator (Mean, and Proportion) using spreadsheet software: Using computer software, students are able to estimate the population mean for a quantitative variable from the sample’s estimated mean value and its associated confidence-interval: estimate the population proportion for a qualitative variable from the sample’s proportion value and its associated confidence-interval: know how to calculate a sample size given a margin of error for a random variable, and explain the meaning of confidence level and margin of error. Students will perform exploratory data analysis using software to find potential outliers and skewed data distributions.

6. Perform hypothesis tests using spreadsheet software: Students will be able to perform a z-test or t-test to determine the validity or non-conclusive decision of a claim or conjecture about a population parameter, know the difference between Type-I and Type-II errors, and be able to explain the meaning of significance, the P-value and the significance level.