General Course Purposes:

1. To gain an appreciation for our humanity as we seek to deal with uncertainty in the face of limited knowledge.
2. To increase awareness and understanding of the uses of mathematics and statistics in business decision-making.
3. To develop an appreciation of statistics as a language well adapted to arriving at logical, non-obvious conclusions.
4. To provide a variety of methods that enhance the decision-making process in the face of uncertainty.
5. To recognize and understand situations in which statistical tools can appropriately aid in the decision-making process.
6. To heighten the students' sensitivity to potential ethical problems in the representation and use of statistical information.

Course Work:

1. **Problem Sets** - Assignments given during the semester will help the student to obtain a working knowledge of the subject matter. Students should be ready to discuss problems in class. Problem sets are due at the indicated times as given with each assignment. Each set is to be properly labeled, stapled and carefully done to be accepted. Late work is not accepted.

2. **Statistics You Can’t Trust*** After reading the first seven chapters of the book, find and critique three “awful examples” of the use of statistics. Each critique must reference the particular notions presented by Campbell in his book. Due dates will be chosen by the class.

3. **Examinations** - Four examinations will be given. Exams are to be taken on the day scheduled. Make-ups will not be given unless arrangements have been made prior to the day of the exam. The final is comprehensive.

4. **Attendance** - Attendance at all sessions is expected. 20 points will be deducted from your total points for each unexcused absence. You must clear any excused absence prior to the day of any event and call in the case of any unexpected and unavoidable circumstance that would keep you from class.

Course Evaluation:

Evaluation will be based on the problem sets, the writing assignments on ethical issues, three mid-term exams and a comprehensive final in the following manner:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
<th>Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>50</td>
<td>450 - 500</td>
<td>A Range</td>
</tr>
<tr>
<td>Ethical Issues</td>
<td>30</td>
<td>400 - 449</td>
<td>B Range</td>
</tr>
<tr>
<td>Exam I - III</td>
<td>100</td>
<td>350 - 399</td>
<td>C Range</td>
</tr>
<tr>
<td>Final Exam</td>
<td>120</td>
<td>300 - 349</td>
<td>D Range</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>500</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Topic</td>
<td>Reading</td>
<td>Problems</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------</td>
<td>---------------</td>
<td>----------</td>
</tr>
<tr>
<td>Aug 23</td>
<td>Introduction</td>
<td>Ch 1</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Summarizing Data</td>
<td>Ch 2.1&amp;2</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Crosstabulations and Scatter Diagrams</td>
<td>Ch 2.3-4</td>
<td></td>
</tr>
<tr>
<td>Sep 6</td>
<td>Measures of Location</td>
<td>Ch 3.1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Measures of Dispersion</td>
<td>Ch 3.2-3</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Association Between Variables</td>
<td>Ch 3.5</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td><strong>Exam I</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Events and Their Probabilities</td>
<td>Ch 4.1-2</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Basic Probability</td>
<td>Ch 4.3</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Conditional Probabilities</td>
<td>Ch 4.4</td>
<td></td>
</tr>
<tr>
<td>Oct 02</td>
<td>Problems with Probabilities</td>
<td>Ch 4.1-4</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Random Variables &amp; Expected Values</td>
<td>Ch 5.1-3</td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>Binomial Distribution</td>
<td>Ch 5.4</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Poisson Distribution</td>
<td>Ch 5.5</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td><strong>Exam II</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Uniform Probability Distribution</td>
<td>Ch 6.1</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Normal Distribution</td>
<td>Ch 6.2</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Normal Distribution</td>
<td>Ch 6.2</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Random Sampling</td>
<td>Ch 7.2&amp;3</td>
<td></td>
</tr>
<tr>
<td>Nov 01</td>
<td>Sampling Dsn of Sample Mean CLT</td>
<td>Ch 7.4&amp;5</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>Sampling Dsn of Sample Proportion</td>
<td>Ch 7.6</td>
<td></td>
</tr>
<tr>
<td>08</td>
<td><strong>Exam III</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Interval Estimation</td>
<td>Ch 8.2</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Sample Size</td>
<td>Ch 8.3</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Interval Estimation – Proportion</td>
<td>Ch 8.4</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Null Hypotheses</td>
<td>Ch 9.1</td>
<td></td>
</tr>
<tr>
<td>Dec 4</td>
<td>Type I &amp; II Errors</td>
<td>Ch 9.2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>One-Tailed Hypothesis Test</td>
<td>Ch 9.3</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Two-Tailed Hypothesis Tests</td>
<td>Ch 9.4</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td><strong>Final Exam (Thursday, 3-5)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Particular Course Objectives**

- Develop an understanding of the term statistics.
- Be able to distinguish between a population and a sample.
- Understand why a sample is often preferred to a census of a population.
- Know the purpose of data summarization procedures.
- Understand what statistical inference is and the role the sample plays in statistical inference.
- Obtain an appreciation of the varied applications where statistical analysis is helpful.
- Learn what a frequency distribution is, how it is constructed, and how it can be used to provide information about a data set.
- Learn what a relative frequency distribution is, how it is constructed, and what information it provides about a data set.
- Understand what a cumulative frequency distribution is, how it is constructed, and what information it provides about a data set.
- Know what the various methods for graphical summary and presentation of a data set are and how they are constructed.
- Understand the purpose of descriptive statistics in general.
- Understand how descriptive statistical rolls can misrepresent data.
- Understand the purpose of measures of location.
- Be able to compute the mean, median, mode, and various percentiles for a set of data.
- Understand the limitations of our measure of location in representing an "average."
- Understand the purpose of measures of dispersion.
- Be able to compute the range, variance, standard deviation, and coefficient of variation for sample or population data.
- Understand how Chebyshev's Theorem and Empirical Rule can be used to compute the percentage of items in a data set within a certain number of standard deviations of the mean.
- Be able to compute the various measures of location and dispersion for grouped data; i.e., when the data is only available in frequency distribution form.
- Understand how measures of dispersion can provide additional insight into the interpretation of statistical data.
- Get a "feel" for how EXCEL and MINITAB is used to summarize data and output a variety of descriptive measures.
- Obtain an appreciation of the role probability information plays in the decision making process.
- Understand probability as a numerical measure of the likelihood of occurrence.
- Know the three methods commonly used for assigning probabilities and understand when they should be used.
- Know how to use the laws that are available for computing the probabilities of events.
- Understand the concepts of a random variable and a probability distribution.

- Be able to distinguish between discrete and continuous random variables.

- Be able to compute and interpret the expected value and variance for a discrete random variable.

- Understand the concept of a joint probability distribution.

- Be able to compute marginal probability distributions from a joint probability distribution and be able to identify when the random variables are independent in a bivariate probability distribution.

- Understand the difference between how probabilities are computed for discrete and continuous random variables.

- Be able to compute probabilities using a normal probability distribution. Understand the role of the standard normal distribution in this process.

- Understand when it is appropriate to apply the binomial, and normal probability distributions in practical problems.

- Know how and when the normal distributions can be used to approximate binomial probabilities.

- Understand the importance of sampling and how results from samples can be used to provide estimates of population characteristics such as the population mean, the population variance and/or the population proportion.

- Know what simple random sampling is and how simple random samples are selected.

- Understand the concept of a sampling distribution.

- Know and memorize the central limit theorem and the important role it plays in sampling.

- Specifically know the characteristics of the sampling distribution of the sample mean (x) and the sampling distribution of the sample proportion (p).

- Become aware of other sampling techniques including stratified simple random sampling, cluster sampling, systematic sampling, convenience sampling and judgment sampling.

- Know how to construct and interpret an interval estimate of a population mean and/or a population proportion.

- Understand the concept of a sampling error

- Be able to use knowledge of a sampling distribution to make probability statements about the sampling error.

- Learn about the t distribution and its use in constructing an interval estimate for a population mean.

- Be able to determine the size of a simple random sample necessary to estimate a population mean and/or a population proportion with a specified level of precision.

- Learn how to formulate and test hypotheses about a population mean and/or a population proportion.

- Understand the types of errors possible when conducting a hypothesis test.

- Be able to determine the probability of making various errors in hypothesis tests.

- Know how to use and interpret standardized test statistics.
- Know how to compute and interpret p-values.
- Learn how to formulate and test hypotheses about a population mean and/or a population proportion
- Understand the types of errors possible when conducting a hypothesis test
- Be able to determine the probability of making various errors in hypothesis tests
- Know how to use and interpret standardized test statistics
- Know how to compute and interpret p-values
- Be able to determine the size of a simple random sample necessary to keep the probability of hypothesis testing errors within acceptable limits
- Analyze statistical presentations for fairness and representativeness
- Understand ethical implication of the use of statistical information
- Consider the use of statistics within the context of "truth telling"
- Identify biblical notions that apply to the use of statistics in decision-making.

**Writing Emphasis Program***

To improve student learning and written communication skills the Department of Business Administration has undertaken a Writing Emphasis Program. Since statistics is a language that enhances our ability to communicate truth to others, care ought to be exercised to ensure that misrepresentations are avoided. We need to be "truth tellers."

Using “Statistics You Can’t Trust” as the springboard, find and critique three “awful examples” of the use of statistics. As noted earlier, each critique must reference the particular notions presented by Campbell in his book. Common sources would include the most popular magazines and newspapers that you read.

Each response will be noted as to proper mechanics, language usage, content and conceptual understanding. Please attach the essential parts of the presentation to your paper. A paper of 200 – 300 words is anticipated.

If you believe you may need support in managing the impact of a disability, please contact Marilyn Meyer, Coordinator of Disability Services, by phone at 3843 or email at meyerm@cedarville.edu. Office located in CAL 164. Examples of disability categories are AD/HD, Specific Learning Disabilities, Hearing, Vision, Health Impairment, Psychological, Orthopedic, and Traumatic Brain Injury. Faculty rely on Disability Services to verify the need for accommodation and to assist in developing reasonable and appropriate accommodation strategies. View website at www.cedarville.edu/DisabilityServices.

This syllabus provides a general plan for the course. Deviations may be necessary.