QMB3200 Descriptive and Inferential Statistics

Course Description: QMB 3200- studies descriptive and inferential statistics with modeling and applications that provide essential information necessary for effective decision making. Topics to be covered include describing data, sampling, interval estimates, hypothesis testing, non-parametric methods, simple and multiple correlation and regression, time series methods, analysis of variance and the analysis of qualitative data. The course is focused on the application and interpretation of information for effective decision-making. This course requires the use of computer software packages. Prerequisites: QMB 2100 or STA 2023. (3 hr. lecture)
Pre/Corequisite: QMB3200

<table>
<thead>
<tr>
<th>Course Competency</th>
<th>Learning Outcomes</th>
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<tr>
<td><strong>Competency 1:</strong> The student will demonstrate an understanding of descriptive statistics by:</td>
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<tr>
<td>1. Designing and formulating sources of business decision-making data</td>
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<td>2. Contrasting between the quality levels of data</td>
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<td>3. Displaying data using visual display techniques</td>
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<td>4. Interpreting and assessing data displayed using visual graphic presentation methods.</td>
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<td><strong>Competency 2:</strong> The student will demonstrate an understanding of managing data by:</td>
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<td>1. Evaluating and analyzing methods for examining central tendencies</td>
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<td>2. Formulating various techniques to analyze data dispersion</td>
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<td>3. Assessing the use of fractile measures such as quartiles, deciles, and percentiles</td>
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<td>4. Creating and interpreting box and whisker plots</td>
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<td>5. Assessing the use of the weighted mean on sets of business data</td>
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<td>6. Demonstrating knowledge of how and when to use the geometric mean and interpreting the results.</td>
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<td><strong>Competency 3:</strong> The student will compute basic probabilities as used in statistical applications by:</td>
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<tr>
<td>1. Comparing the concepts of probability</td>
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<td>2. Demonstrating the elementary rules of probability</td>
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<td>3. Creating uses for Bayes’ Theorem</td>
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<td>4. Differentiating among the counting rules</td>
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<td><strong>Competency 4:</strong> The student will prove an understanding of discrete probability distributions by:</td>
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<td>1. Assembling a discrete probability distribution</td>
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<td>2. Solving binomial distribution problems that require the use of a discrete binomial distribution</td>
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<td>3. Planning and proposing the uses of the Poisson distribution for solving problems</td>
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<td>4. Considering the proper use of the hypergeometric distribution for solving problems</td>
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<td>5. Judging the best approach for using Excel to solve problems that require a binomial, Poisson, or hypergeometric approach.</td>
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Competency 5: The student will prove the ability to apply continuous random variables by:

1. Analyzing data that require uniform distributions
2. Constructing problems requiring the application of normal distributions
3. Assessing the use of the normal distribution to approximate the binomial distribution
4. Considering and applying the proper approach for using Excel to solve continuous distribution problems.

Competency 6: The student will show a working knowledge of sampling, sampling distributions, and confidence intervals by:

1. Constructing a sampling distribution of the sample mean
2. Constructing a sampling distribution of the sample proportion
3. Comparing and contrasting the common methods for gathering sample data
4. Contrasting the best methods for using Excel to generate random numbers to simulate gathering sample data
5. Producing a confidence interval for a mean with a known population standard deviation
6. Producing a confidence interval for a mean with an unknown population standard deviation
7. Producing a confidence interval for a proportion
8. Considering the use of mathematical techniques for determining the appropriate sample size for experiments under varying circumstances
9. Selecting an Excel approach for solving confidence interval problems
10. Selecting an Excel approach for solving sample size problems.

Competency 7: The student will demonstrate an understanding of the use and application of hypothesis testing by:

1. Developing null and alternate hypotheses to test problems
2. Solving problems applying a z-test for means
3. Setting up and solving problems applying a t-test for means
4. Setting up and solving problems applying a z-test for proportions
5. Setting up and solving problems applying a z-test for means with two samples of data
6. Organizing and executing problems applying a t-test for means with two samples of data
7. Organizing and executing problems applying a z-test for proportions with two samples of data
8. Evaluating the various types of errors possible
9. Designing and formulating hypothesis testing problems that will be solved using Excel.

Competency 8: The student will demonstrate an understanding of how to design an experiment by:

1. Judging the optimal use of one-way analysis of variance in conducting an experiment
2. Judging the optimal use of two-way analysis of variance for conducting an experiment
3. Assessing the various blocking designs
4. Selecting the proper method for using Excel to conduct experiments applying ANOVA.

Competency 9: The student will prove an understanding of the applications of Chi-square by:

1. Developing a Chi-square goodness-of-fit test
2. Preparing a Chi-square test for independence
3. Selecting the proper method for using Excel to solve Chi-square problems
4. Evaluating the findings that result from Chi-square experiments.
**Competency 10:** The student will prove an understanding of how to apply linear regression to analyze problems by:

1. Appraising how the least squares principle applies to linear regression
2. Comparing and contrasting the assumptions of the linear regression model
3. Measuring the y-intercept and the slope of a line
4. Evaluating and interpreting the coefficient of determination
5. Designing a test for the significance of a correlation
6. Designing an F-test
7. Evaluating and interpreting residuals
8. Selecting the optimal method for using Excel to conduct correlation and regression problems
9. Evaluating and interpreting accurately the results of correlation and regression problems.

**Competency 11:** The student will demonstrate an understanding of multiple regression by:

1. Designing tests that require applying multiple regression to analyze selected problems
2. Evaluating the use of multiple regression, describing its limitations, assumptions, and error measures
3. Designing a technique for applying tests of significance for independent variables
4. Measuring and describing residuals and their importance
5. Selecting the appropriate method for using Excel or similar software to conduct a multiple regression analysis
6. Analyzing and interpreting the results of the multiple regression analysis.

**Competency 12:** The student will demonstrate an understanding of the use of time series analysis by:

1. Formulating methods for using time series analysis for addressing business problems
2. Analyzing and accurately interpreting time series data
3. Selecting the best Excel or similar software tool for conducting time series analyses.