

## WTCS Repository

10-804-135 Quantitative Reasoning

# Course Outcome Summary

### Course Information

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|  | Description | This course is intended to develop analytic reasoning and the ability to solve quantitative problems. Topics include logic, probability, descriptive and inferential statistics, linear and non-linear modeling, graphical representation, and functions.  The course emphasizes appropriate use of units, dimensions, estimates, mathematical notation, and technology. |
|  | Total Credits | 3 |

### Course Competencies

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| 1. | Analyze logical arguments |
|  | Assessment Strategies |
|  | 1.1. | Oral, Written or Graphic Assessment |
|  | Criteria |
|  | 1.1. | identify logical fallacies in popular arguments |
|  | 1.2. | recognize arguments as inductive or deductive |
|  | 1.3. | identify inconsistencies in statistical arguments |
|  | 1.4. | test conditions and/or reasonableness of assumptions |
| 2. | Employ counting principles |
|  | Assessment Strategies |
|  | 2.1. | Oral, Written or Graphic Assessment |
|  | Criteria |
|  | 2.1. | apply the multiplication principle to determine the number of outcomes |
|  | 2.2. | determine the size of intersections, unions, and complements of sets |
|  | 2.3. | apply rules of counting in solving applied contexts |
| 3. | Utilize probability models and rules |
|  | Assessment Strategies |
|  | 3.1. | Oral, Written or Graphic Assessment |
|  | Criteria |
|  | 3.1. | distinguish between theoretical and empirical probability |
|  | 3.2. | compute probability using the basic definition |
|  | 3.3. | compute the probability of joint and disjoint events |
|  | 3.4. | compute conditional probabilities |
|  | 3.5. | determine if two events are independent |
| 4. | Employ descriptive statistics |
|  | Assessment Strategies |
|  | 4.1. | Oral, Written or Graphic Assessment |
|  | Criteria |
|  | 4.1. | generate frequency distributions from a given data set |
|  | 4.2. | calculate the mean, median, and mode of a distribution |
|  | 4.3. | interpret the mean, median, and mode as measures of central tendency |
|  | 4.4. | calculate quartile and percentile ranks as measures of position |
|  | 4.5. | calculate range, standard deviation, and interquartile range as measures of spread for a distribution |
|  | 4.6. | identify and interpret outliers |
|  | 4.7. | use measures of central tendency and spread to compare and contrast two distributions |
|  | 4.8. | construct a modified box-and-whisker plot to summarize comparisons |
|  | 4.9. | use the language of probability to describe and evaluate statements involving risk |
| 5. | Apply inferential statistics |
|  | Assessment Strategies |
|  | 5.1. | Oral, Written or Graphic Assessment |
|  | Criteria |
|  | 5.1. | evaluate sampling strategies |
|  | 5.2. | determine sources of bias |
|  | 5.3. | describe the difference between correlation and causation |
|  | 5.4. | identify confounding variables |
|  | 5.5. | interpret a confidence interval in applied contexts |
|  | 5.6. | interpret a confidence interval to estimate a population parameter |
|  | 5.7. | interpret the error term for a confidence interval |
| 6. | Apply non-linear mathematical models |
|  | Assessment Strategies |
|  | 6.1. | Oral, Written or Graphic Assessment |
|  | Criteria |
|  | 6.1. | identify appropriate models for given data sets and applications |
|  | 6.2. | construct a non-linear model to fit source data |
|  | 6.3. | identify reasonable domain and range for a non-linear model |
|  | 6.4. | employ solution techniques to solve for an unknown value in the non-linear function model |
|  | 6.5. | utilize solutions to interpret results in an applied context |
|  | 6.6. | identify important characteristics of models |
| 7. | Develop graphical representations |
|  | Assessment Strategies |
|  | 7.1. | Oral, Written or Graphic Assessment |
|  | Criteria |
|  | 7.1. | plot points to construct the graph of a given equation |
|  | 7.2. | evaluate graphs in an applied context |
|  | 7.3. | construct pie charts, bar graphs, and line graphs |
|  | 7.4. | construct appropriate charts or graphs for specific scenarios |
|  | 7.5. | utilize function tables |
|  | 7.6. | employ calculators, spreadsheets, or other technological tools for construction of various graphs |
|  | 7.7. | construct scatterplots of bivariate data |
| 8. | Apply principles of measurement |
|  | Assessment Strategies |
|  | 8.1. | Oral, Written or Graphic Assessment |
|  | Criteria |
|  | 8.1. | use appropriate units |
|  | 8.2. | convert units as needed |
|  | 8.3. | round values appropriately in an applied context |
| 9. | Apply linear mathematical models |
|  | Assessment Strategies |
|  | 9.1. | Oral, Written or Graphic Assessment |
|  | Criteria |
|  | 9.1. | construct a linear model to fit source data |
|  | 9.2. | identify reasonable domain and range for a linear model |
|  | 9.3. | compute the slope and intercept |
|  | 9.4. | interpret the slope and intercept in an applied context |
|  | 9.5. | employ solution techniques to solve for an unknown value in the linear functional model |
|  | 9.6. | utilize solutions to interpret results in an applied context |