

## 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 to be covered may include: construction & interpretation of graphs; descriptive statistics; geometry & spatial visualizations; math of finance; functions and modeling; probability; and logic. Appropriate use of units and dimensions, estimates, mathematical notation, and available technology will be emphasized throughout the course. |
|  | Total Credits | 3.00 |

### Course Competencies

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| 1. | Analyze logical arguments | |
|  | Assessment Strategies | |
|  | 1.1. | in the solution to a problem on a quiz, homework, project or exam |
|  | Criteria | |
|  | 1.1. | you identify logical fallacies in popular arguments |
|  | 1.2. | you recognize arguments as inductive or deductive |
|  | 1.3. | you construct a short deductive proof |
|  | 1.4. | you identify inconsistencies in statistical arguments |
|  | 1.5. | you identify necessary assumptions and/or conditions for statistical techniques |
|  | 1.6. | you test conditions and/or reasonableness of assumptions |
| 2. | Employ counting principles | |
|  | Assessment Strategies | |
|  | 2.1. | in the solution on a quiz, homework, project or exam |
|  | Criteria | |
|  | 2.1. | you apply permutations in determining the cardinality of ordered subsets |
|  | 2.2. | you apply combinations in determining the cardinality of unordered subsets |
|  | 2.3. | you determine the size of intersections, unions, and complements of sets |
|  | 2.4. | you apply rules of counting in solving applied contexts |
| 3. | Utilize probability models and rules | |
|  | Assessment Strategies | |
|  | 3.1. | in the solution to a problem on a quiz, homework, project or exam |
|  | Criteria | |
|  | 3.1. | you distinguish between theoretical and empirical probability |
|  | 3.2. | you compute probability using the basic definition |
|  | 3.3. | you compute the probability of joint and disjoint events |
|  | 3.4. | you compute conditional probabilities |
|  | 3.5. | you determine if two events are independent |
| 4. | Employ descriptive statistics | |
|  | Assessment Strategies | |
|  | 4.1. | in the solution to a problem on a quiz, homework, project or exam |
|  | Criteria | |
|  | 4.1. | you generate frequency distributions from a given data set |
|  | 4.2. | you calculate the mean, median, and mode of a distribution |
|  | 4.3. | you interpret the mean, median, and mode as measures of central tendency |
|  | 4.4. | you calculate quartile and percentile ranks as measures of position |
|  | 4.5. | you calculate range, standard deviation, and interquartile range as measures of spread for a distribution |
|  | 4.6. | you identify and interpret outliers |
|  | 4.7. | you use measures of central tendency and spread to compare and contrast two distributions |
|  | 4.8. | you construct a modified box-and-whisker plot to summarize comparisons |
|  | 4.9. | you use the language of probability to describe and evaluate statements involving risk |
| 5. | Apply inferential statistics | |
|  | Assessment Strategies | |
|  | 5.1. | in the solution to a problem on a quiz, homework, project or exam |
|  | Criteria | |
|  | 5.1. | you evaluate sampling strategies |
|  | 5.2. | you determine sources of bias |
|  | 5.3. | you describe the difference between correlation and causation |
|  | 5.4. | you distinguish between discrete and continuous probability distributions |
|  | 5.5. | you interpret probability as an area under the probability distribution |
|  | 5.6. | you identify confounding variables |
|  | 5.7. | you compute probabilities of events for discrete random variables |
|  | 5.8. | you compute probabilities of events for normally distributed random variables |
|  | 5.9. | you interpret normal distribution probabilities in solving applied contexts |
|  | 5.10. | you construct a confidence interval to estimate a population parameter |
|  | 5.11. | you interpret the error term for a confidence interval |
| 6. | Apply non-linear mathematical models | |
|  | Assessment Strategies | |
|  | 6.1. | in the solution to a problem on a quiz, homework, project or exam |
|  | Criteria | |
|  | 6.1. | you identify appropriate models for given data sets and applications |
|  | 6.2. | you develop piecewise, exponential, logarithmic, and logistic models to fit source data from real contextual applications |
|  | 6.3. | you identify reasonable domain and range for a non-linear or piecewise function model |
|  | 6.4. | you analyze model break-down conditions |
|  | 6.5. | you employ solution techniques to solve for an unknown value in the function model |
|  | 6.6. | you utilize solutions to interpret results in an applied context |
|  | 6.7. | you identify important characteristics of models (increasing/decreasing, cyclic, piecewise, etc.) that represent real world contexts |
|  | 6.8. | you understand that abstract mathematical models used to characterize real-world scenarios or physical relationships are not always exact and are subject to error |
|  | 6.9. | you create and use exponential models of real-world situations including growth and decay models |
|  | 6.10. | you compute interest amount and compound amount in compound interest financial models |
|  | 6.11. | you compute present and future values for compound interest applications |
|  | 6.12. | you compute the amount and payment of an annuity |
|  | 6.13. | you calculate the present and future value of an annuity |
| 7. | Develop graphical representations | |
|  | Assessment Strategies | |
|  | 7.1. | in the solution to a problem on a quiz, homework, project or exam |
|  | Criteria | |
|  | 7.1. | you plot points to construct the graph of a given equation |
|  | 7.2. | you evaluate graphs in an applied context |
|  | 7.3. | you construct pie charts, bar graphs, and line graphs |
|  | 7.4. | you construct appropriate charts or graphs to depict distributions |
|  | 7.5. | you utilize function tables |
|  | 7.6. | you employ calculators, spreadsheets, or other technological tools for construction of various graphs |
|  | 7.7. | you construct scatterplots of bivariate data |
| 8. | Apply principles of geometry | |
|  | Assessment Strategies | |
|  | 8.1. | in the solution to a problem on a quiz, homework, project or exam |
|  | Criteria | |
|  | 8.1. | you use appropriate units |
|  | 8.2. | you convert units as needed |
|  | 8.3. | you use precision and accuracy to round values appropriately |
|  | 8.4. | you apply circumference, perimeter and area of plane figures to physical applications |
|  | 8.5. | you apply volumes of three dimensional figures to physical applications |
| 9. | Apply linear mathematical models | |
|  | Assessment Strategies | |
|  | 9.1. | in the solution to a problem on a quiz, homework, project or exam |
|  | Criteria | |
|  | 9.1. | you assign variables as needed |
|  | 9.2. | you develop linear equations which express inherent relationships in an applied context |
|  | 9.3. | you describe the behavior of linear models using words, algebraic symbols, graphs, and tables |
|  | 9.4. | you identify reasonable domain and range for a linear model |
|  | 9.5. | you use appropriate terms and units to describe rate of change |
|  | 9.6. | you compute the slope and intercept for a regression line |
|  | 9.7. | you interpret the slope and intercept for a regression line in an applied context |
|  | 9.8. | you analyze model break-down conditions |
|  | 9.9. | you employ solution techniques to solve for an unknown value in the functional model |
|  | 9.10. | you utilize solutions to interpret results in an applied context |
|  | 9.11. | you compute principal, rate, and time in simple interest financial models |