Quantitative Reasoning Emphasis Courses in General Education

Definition:
Quantitative reasoning represents the ability to reason and solve quantitative problems in a wide array of authentic contexts and everyday-life situations.

Outcome: Students will be able to create arguments or algorithms supported by quantitative evidence and clearly communicate those arguments in a variety of formats (using words, tables, graphs, mathematical equations, and computer programs as appropriate).

General Education courses that emphasize Quantitative Reasoning should show that they explicitly teach this essential skill by dedicating class time to quantitative reasoning learning opportunities. Assignments might include activities that require students to present information in a mathematical or scientific manner, making use of formulas, graphs, tables, or other representations; look for prevailing or recurrent patterns; find all possible solutions to a problem; collect data, perform appropriate analyses, and draw conclusions; or solve application problems related to quantitative reasoning.

✓	**Syllabus Requirements**
☐	Include at least one CSLO related to quantitative reasoning
☐	Align CSLOs to ILO 7 – Scientific and Quantitative Reasoning
☐	Include a schedule of quantitative reasoning activities and assignments, such as quizzes, homework, tests, individual/group work, or presentations
☐	Dedicate adequate class-time to quantitative reasoning and problem-solving
☐	Incorporate reflection assignments showing personal growth through quantitative reasoning
☐	Measure and assess quantitative reasoning skills through the administration of quizzes, tests, homework, lab assignments, etc.
☐	Assign at least 50% of the grade to quantitative reasoning
☐	In the approval process, submit at least one example of a quantitative reasoning assignment and explain how it will be assessed using the University Quantitative Reasoning Rubric

Examples of CSLOs that cover quantitative reasoning:

- Solve quantitative problems
- Convert and explain information between mathematical and non-mathematical languages
- Interpret numerical information
- Represent quantitative information in tables, graphs, diagrams, and other displays
- Use quantitative evidence in support of an argument or proposal
- Identify assumptions in quantitative reasoning

Quantitative Reasoning Rubric

	Level 1	Level 2	Level 3	Level 4
Interpretation and Representation Ability to explain and convert information presented into various mathematical forms	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information. Skillfully converts relevant information into an insightful mathematical portrayal in a way that contributes to a further or deeper understanding.	Provides accurate explanations of information presented in mathematical forms. Competently converts relevant information into an appropriate and desired mathematical portrayal.	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units. Completes conversion of information but resulting mathematical portrayal is only partially appropriate or accurate.	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means. Completes conversion of information but resulting mathematical portrayal is inappropriate or inaccurate.
Identify Strategies and Calculation Ability to solve or calculate the problem that apply within a specific context.	Identifies multiple approaches for solving the problem that apply within a specific context. Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem. Calculations are also presented elegantly (clearly, concisely, etc.	Identifies multiple approaches for solving the problem, only some of which apply within a specific context. Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem.	Identifies only a single approach for solving the problem that does apply within a specific context. Calculations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem.	Identifies one or more approaches for solving the problem that do not apply within a specific context. Calculations are attempted but are both unsuccessful and are not comprehensive.
Propose Solutions / Analysis / Assumptions Ability to propose one or more solutions/hypotheses that indicates of the problem. Ability to make judgments and draw appropriate conclusions based on the estimation, modeling, and data analysis	Proposes one or more solutions/hypotheses that indicates a deep comprehension of the problem. Solution/hypotheses are sensitive to contextual factors as well as all of the following: ethical, logical, and cultural dimensions of the problem. Uses the quantitative analysis of data as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work. Explicitly describes assumptions and provides compelling rationale for why each assumption is appropriate. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.	Proposes one or more solutions/hypotheses that indicates comprehension of the problem. Solutions/hypotheses are sensitive to contextual factors as well as the one of the following: ethical, logical, or cultural dimensions of the problem. Uses the quantitative analysis of data as the basis for competent judgments, drawing reasonable and appropriately qualified conclusions from this work. Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate.	Proposes one solution/hypothesis that is “off the shelf” rather than individually designed to address the specific contextual factors of the problem. Uses the quantitative analysis of data as the basis for workmanlike (without inspiration or nuance, ordinary) judgments, drawing plausible conclusions from this work. Explicitly describes assumptions.	Proposes a solution/hypothesis that is difficult to evaluate because it is vague or only indirectly addresses the problem statement. Uses the quantitative analysis of data as the basis for tentative, basic judgments, although is hesitant or uncertain about drawing conclusions from this work. Attempts to describe assumptions.
Communication and Evaluate Outcomes Ability to express quantitative evidence in support of the argument or purpose of the work and review results relative to the problem to predict strategy for solving future problems	Uses quantitative information in connection with the argument or purpose of the work, presents it in an effective format, and explicates it with consistently high quality. Reviews results relative to the problem defined with thorough, specific considerations of need for further work.	Uses quantitative information in connection with the argument or purpose of the work, though data may be presented in a less than completely effective format or some parts of the explication may be uneven. Reviews results relative to the problem defined with some consideration of need for further work.	Uses quantitative information, but does not effectively connect it to the argument or purpose of the work. Reviews results in terms of the problem defined with little, if any, consideration of need for further work.	Presents an argument for which quantitative evidence is pertinent, but does not provide adequate explicit numerical support. Reviews results superficially in terms of the problem defined with no consideration of need for further work