GENERAL EDUCATION COURSE PROPOSAL
WEBER STATE UNIVERSITY
**QUANTITATIVE LITERACY**

Area: **QUANTITATIVE LITERACTY (QL)**

Date: ____9/14/2011_____

College: __Science_____

Department: _Mathematics_____

Catalog Abbreviation: _MATH QL1040_____

Catalog Title: __Introduction to Statistics_____

Course Number: _Math 1040_____
Credit Hours: __3___

Substantive: _____
New: _____
Revised: _____
Renewal __X___
Effective Date ____*7/1/2012*_____

Course description as you want it to appear in the catalog:
Current Catalog description:
Basic concepts of probability and statistics including data collection and analysis, correlation and regression, probability, discrete and continuous distributions (binomial, normal, and t distributions), estimation and hypothesis testing, with an emphasis on applications and understanding of the main ideas.

## QUANTITATIVE LITERACY (QL) GENERAL EDUCATION MISSION STATEMENT

*It is the mission of Weber State University to produce graduates that can reason quantitatively within the context of their majors and career goals. This includes understanding information and reasoning that is numerical, geometric, algebraic, graphical, and statistical -- and at the level of sophistication of college algebra (e.g. MATH 1050).*

## QUANTITATIVE LITERACY LEARNING OUTCOMES

A student completing a Quantitative Literacy general education course should be able to demonstrate a reasonable understanding of the following core objectives.

*Provide a justification of how the proposed course prepares students to successfully demonstrate competency in **EACH** of the core objectives. Cite specific lecture topics, written assignments, and/or lab projects and explain how they address each of the core competencies. Refer to your attached syllabus as needed.*

*Objective 1:* Interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them.
Justification: Math 1040, Introduction to Statistics develops the mathematics of practical statistics at the level needed for disciplines that make use of statistics but do not require calculus. Mathematical models include numerical statistics such as measures of central tendency, dispersion and position; probability distributions; data summarized graphically and in tables; confidence intervals and hypothesis tests. The latter two models are fundamentally inferential in nature, and close attention is paid to the language of hypothesis testing. The formulas and derivations for many of those models are developed and justified. The formulas are then used in computations.

*Objective 2:* Represent mathematical information symbolically, visually, numerically, and verbally.
Justification: Statistics can be characterized as the science of data collection. The raw data itself need not be mathematical, but to apply statistics one must find ways of interpreting the data mathematically. This is done by organizing qualitative and quantitative data in appropriate tables and graphs which represent the information numerically and visually, respectively. It is usually appropriate to use a standard statistical model like the normal distribution. In this context, it is best to symbolically label the data together with the summary statistics (such as the measures of position, central tendency and dispersion) in mathematical terminology. When making hypothesis tests about the population and data, one must verbally state the hypothesis. After conducting the test, one must state the conclusion carefully. A typical 1040 class discusses this in the section ``The Language of Hypothesis Testing''.

*Objective 3:* Use arithmetical, algebraic, geometric, and statistical methods to solve problems.
Justification: When hypothesis testing is discussed in Math 1040, the probability distribution that is used most often is the standard normal distribution. Generally the data given, although approximately normally distributed, is not in standard form. To transform the data into standard form, one must use an algebraic formula. To properly infer something about the data, the geometric representation of the standard normal distribution as a graph is emphasized. Arithmetical techniques of spotting a possible relationship between two phenomena (for example smoking and lung cancer) are very much a part of the discussion in Math 1040 in the chapter on least-squares regression. The entire course is concerned with statistical methods. In the context of problem-solving, examples include discussions on assessing

normality and sources of error in sampling.

*Objective 4:* Estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results.
Justification: The chapter on probability describes a variety of techniques to compute probabilities: the addition rule, complements, independence, the multiplication rule and conditional probability. These techniques allow one to compute and estimate probabilities in a variety of ways, yet for any given scenario, they may yield different results. The objective of the student is to identify which rule is reasonable in the given situation: for example, "are the events independent?" and "are the events conditionally related?" are two important questions to ask. It is also possible, especially with counting techniques, that two apparently distinct methods are equivalent. In that situation, identifying which is optimal is important.

*Objective 5:* Recognize that mathematical and statistical methods have limits.
Justification: A key part in the Math 1040 course is a discussion of mathematical error. This includes an analysis of the sources of error in sampling and a thorough conversation about Type I and Type II Errors in hypothesis testing. As soon as it is understood that errors can arise from sampling and statistical tests, it is immediate that statistical methods have limits. In the discussion on probability, independent events are discussed. Whether or not two or more events are actually independent is a critical concern. If they are not independent, then the multiplication rule for probabilities cannot apply. Hence, applying probability to real world situations where it is not clear that two events are independent has potential pitfalls which are addressed explicitly in the probability chapter.

**COMPLETE THE FOLLOWING**

1. Has this proposal been discussed with and approved by the department?
   This course has been discussed and unanimously approved by the department.

2. List those general education courses in other departments with similar subject matter and explain how this course differs.
   There are none.

3. If the proposed new general education course affects course requirements or enrollments in other departments, list the departments and programs involved and attach comments from each.
   Not applicable, this is not a new course.

4. Attach a syllabus of the course. Include the number of contact hours per week and the format of these hours (e.g., lecture, lab, field trip, etc.).
   See Attachment

**New Courses Only:**

5. Discuss how you will assess student learning outcomes associated with this course
   This is not a new course.

**Current General Education Courses and Existing Courses Seeking General Education Status:**

6. Discuss how you have assessed the applicable or identified student learning outcomes associated with this course.

Course Assessment
Assessment of Math QL1040, Introduction to Statistics is mainly done by the department level

QL/Lower Division Committee and discussions during department meetings. The following are done:
1. Data is collected on pass rates of the Math QL courses at WSU (and at other state schools if we can obtain that information from the state office). See the attachment.
2. Consideration of alternate texts for the course
3. Consideration and discussions about adjusting course content and the level and extent of problem solving
4. Attendance of the yearly majors meetings organized by the Regent's Majors Committee
5. Teaching evaluations are completed by the students.

Adjunct Instructors

One or Two Adjunct Instructors instruct sections of Math 1040 each semester. Assessment and oversight of Adjunct Instructors is mainly done by the Department Chair. The department maintains a set of policies for Adjunct Instructors (it is attached).
The Department Chair does the following:
1. Hold at least one retreat each year for Adjunct Instructors to go over policies, have discussions, and answer questions
2. Review their teaching evaluations and address problems that may arise
3. Review their graded final exams to see if they are covering most of the course material
4. Hold a one on one interview with each instructor to discuss their courses and answer questions

Student Assessment

Student assessment is accomplished by reading and problem solving assignments, quizzes and exams. All instructors, Faculty and Adjuncts give 3 or 4 Midterm Exams and a Final Exam. The instructors design their own exams. They make up questions and problems similar to those discussed in the course. There may be a few fill in the blank, short answer, multiple choice or true/false questions, but most of the exams consist of questions that require the students to work out the solution and present any pertinent work. The questions are designed to see if they have learned the mathematics in the course, that is to determine if students can correctly use the symbols, understand the graphical or geometric relationships and understand the definitions and properties. There are questions that require students to use arithmetic, algebra and geometry to solve problems. There are questions about setting up and solving applied problems. All instructors grade their own exams. Seldom does a correct answer alone get full credit. Student's work is being checked to see if they can correctly set up and use the language of Math to get to an answer. Some instructors also grade homework and/or quizzes. Some instructors require students to answer questions using Math XL (the computer program used in TERM of the Developmental Math Program.) Others make Math XL available to students but do not require it.

7. How has this assessment information been used to improve student learning?

Course Assessment

1. Pass rates in Math QL1040 have been fairly good. See the attachment.
2. Each year department representatives attend "Majors Meetings" to coordinate course content, prerequisites, and other aspects of the course with other state schools. Recently this has resulted in our consideration of changes in the prerequisite expirations.
3. We have made two offices available to Adjunct Instructors in which they can meet with students.
4. Each Faculty member reviews their teaching evaluations. The Chair reviews these as well. Student comments are mostly favorable.

Adjunct Instructor Assessment

1. The reviews of the final exams that Adjunct Instructors give in their courses indicate that they are covering most of the course topics.
2. Student Teaching evaluations indicate that instructors are doing a good job.

GENERAL EDUCATION COURSE APPROVAL PAGE

**Approval Sequence:**

_____
Department Chair/Date

_____
Dean of College/Date

_____
University Curriculum Committee/Date

Passed by Faculty Senate_____Date