GENERAL EDUCATION COURSE PROPOSAL
WEBER STATE UNIVERSITY
QUANTITATIVE LITERACY

Area: **QUANTITATIVE LITERACY (QL)**

Date: _____9/14/2011_____

College: _Science_____

Department: Mathematics_____

Catalog Abbreviation: _MATH QL1050_____

Catalog Title: __College Algebra_____

Course Number: _Math _1050_____
Credit Hours: __4___

Substantive: _____
New: _____
Revised: _____
Renewal __X___
Effective Date ___7/1/2011_____

Course description as you want it to appear in the catalog:

This course covers a survey of college mathematics and is also a preparatory course for calculus. Topics from continuous mathematics include polynomial, rational, exponential and logarithmic functions, equations and their applications, absolute value, polynomial and rational inequalities, and nonlinear systems. Topics from discrete mathematics include matrices, matrix algebra and inverses, determinants, sequences and series, counting techniques, and an introduction to probability. In addition, mathematics of finance, rational zero and binomial theorems and mathematical induction are covered briefly.

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 1050, College Algebra discusses eight basic mathematical topics at the college level (see the course coverage topics in the syllabus). While several of these, inequalities, functions, polynomials, exponential and logarithmic functions are introduced in the high school intermediate algebra course, Math 1050 goes over these again and extends their usage. Math 1050 gives an introduction to the remaining topics listed under the course coverage. The topics are explained numerically, graphically and with sketches and tables. It is shown how these structures are symbolically represented. Examples of how they are used to give quantitative representation and solve physical problems are given. For example the differences between algebraic expressions, equations, inequalities and functions are discussed. One of the most basic and useful of mathematical structures is the function. The course discusses the differences and characteristics of four of the most basic types of functions: polynomials (including quadratics), rational, exponential and logarithmic. The differences in their formulas and graphs are identified. These functions are used to construct models for physical problems. Student assignments consist of understanding the definitions, laws, properties and relationships. They also consist of working with the notation and symbols, sketching graphs of functions, and solving applied problems. The other topics in the course content of the syllabus are discussed in a similar manner.

Objective 2: Represent mathematical information symbolically, visually, numerically, and verbally.

Justification: This course is rich in numerous symbolic, visual, numerical and verbal representation of mathematical information. For instance, topics like inequalities, algebraic equations, systems of linear or non-linear equations, exponential and logarithmic equations, the binomial formula, arithmetic and geometric sequences, etc. deal with the symbolic representation of mathematical information. Topics like graphs of algebraic and rational functions teach students about visual representations. Matrices, matrix algebra, inverse matrices and determinants illustrate important numerical representations in mathematics. A number of important definitions and applied problems show how mathematical information can also be presented verbally.

Objective 3: Use arithmetical, algebraic, geometric, and statistical methods to solve problems.

Justification: Various methods for solving problems are discussed in Math 1050. Solving even an elementary linear equation requires arithmetic methods. As an example, when solving problems in the mathematics of finance, students learn how to use algebraic methods to solve important applied problems. A number of topics in College Algebra, including problems that involve calculating perimeters, areas, surface areas, etc., illustrate applications in Geometry. Topics such as counting, permutations, combinations and probability show probabilistic/statistical techniques of solving problems.

Objective 4: Estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results.

Justification: In College Algebra, students are taught how to check the correctness of answers. Examples include: solving algebraic equations, systems of linear or non-linear equations, dividing using synthetic division and checking whether a given a function (matrix) is the inverse of the given function (matrix). Students are also taught how to estimate solutions when they cannot be obtained explicitly: Descartes' Rule of Signs and Intermediate Value Theorem can be used to estimate the root of a polynomial equation. It is important to know that alternative methods exist to solve a given problem. This objective is illustrated by three different methods for solving of a square system of linear equations: Gaussian elimination, Cramer's rule and inverse matrices. The topic of Quadratic Models shows how to select an optimal result for quantities expressed by quadratic equations.

Objective 5: Recognize that mathematical and statistical methods have limits.

Justification: In Math 1050, students are shown not only the power of mathematical and statistical methods, but their limitations as well. For example, many algebraic, exponential or logarithmic equations can be solved symbolically. However, when it comes to actual numerical values of solutions, unless solutions are rational, they cannot be evaluated exactly. Although The Fundamental Theorem of Algebra guarantees existence of a root for any polynomial equation of degree one or higher, finding the root explicitly may not always be possible. Similarly, calculating the probabilities of events involves the major assumption of equally likely outcomes. However, in practice outcomes are seldom equally likely. Thus, calculations involving the probabilities of events do have limitations. Limitations also exist when mathematical models are used to solve physical problems as the model only includes the most important features of the application.

COMPLETE THE FOLLOWING

1. Has this proposal been discussed with and approved by the department?
   This proposal 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 course is not new.

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 1050, College Algebra is mainly done by the department level QL/Lower Division Committee and discussions during department meetings. The following are done:

1. Collection of data on pass rates of 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 of each section.

Adjunct Instructors

A large number of adjunct instructors teach the QL courses and in particular Math 1050. Currently, Fall 2011 there are 10 adjunct instructors teaching 13 of the 25 sections of Math 1050. 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 an 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. Faculty discussions indicated that a major reason that students are failing Math 1050 is that they are unable to do basic algebra. Math 1050 does not review such things as working with fractions and exponents. Even though students had satisfied the prerequisite, they had forgotten basic algebra. As a result prerequisite expirations were instituted. More recently the Developmental Math Program has developed TERM. It is hoped that it will help students attain and retain the basic algebraic skills and other introductory knowledge such as exponential and logarithmic functions used in QL math courses. The Placement Policy from the Catalog is attached.
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. Tutoring Labs have been instituted. Efforts are made to ensure that the tutors have sufficient knowledge to help students. Most if not all the tutors hired for the "The Solution Space", a tutoring lab on the Math Floor are capable of tutoring up through Calculus II.
5. Pass rates are similar to national rates.

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 most instructors are doing a good job. In one instance though, an instructor was more difficult than average. After an interview and several discussions he has reduced his expectations of student performance.

Other assessments have been done:

1. To see if students were obtaining knowledge and skills, a sample of Math 1050 sections were given a pre course test and a post course test. The results indicated that students had gained a lot from the course.
2. To coordinate course topics in Math 1050 with other state schools a very detailed spread sheet was completed for the Regent's Majors Committee. This is helping align the course across state schools.

GENERAL EDUCATION COURSE APPROVAL PAGE

Approval Sequence:

_____
Department Chair/Date

_____
Dean of College/Date

_____
University Curriculum Committee/Date

Passed by Faculty Senate_____Date