Application for Certification of a Course as a General Education Course

CTE QUANTITATIVE AND LOGICAL REASONING CATEGORY

Applicant: Robert Bates and Sterling Foster
Course Alpha and Number: Math 150
Course Title: Technical College Mathematics

Instructions:
Explain how the learning taking place in this course meets the requirements listed below for the Quantitative and Logical Reasoning General Education Category. Do both of the following:

- Identify specific course SLOs that align with each requirement.
- Describe class assignments or activities in which students learn and/or demonstrate the requirement objective. Assignments and/or activities cited should be sufficiently important in terms of both time spent on them and their impact on students’ final grades in the course.

Try to address all of the requirements. The strength of some responses should counterbalance the weakness of others. Address each of the questions listed under each requirement with typed responses.

Also attach a copy of the official course outline (see Curriculum Proposal Form).

The Requirements:

The course...

1. Promotes the recognition of formal numerical and symbolic systems and an understanding of what they represent.
   a. Does the course require students to demonstrate their knowledge of the meaning and use of formal numerical and symbolic systems? Yes / No
   b. What activities or assignments must students do to demonstrate this knowledge?
   c. What Specific Skills are the students evaluated on?

2. Promotes an understanding of the basic operating principles or rules that govern the use of those formal systems.
   a. Does the course require students to demonstrate their understanding of the established rules and principles regarding how to use formal numerical and symbolic systems of representation? Yes / No
   b. What activities or assignments must students do to demonstrate this knowledge?
   c. What Specific Skills are the students evaluated on?

3. Promotes an understanding of the connection between real-world problems and their expression and solution in the language of formal systems.
   a. Does the course require students to apply an understanding of the use of formal symbols to how they apply to addressing real-world issues and problems? Yes / No
   b. What activities or assignments must students do to demonstrate this knowledge?
   c. What Specific Skills are the students evaluated on?

4. Emphasizes the ability to analyze a problem and correctly select the means by which it can be solved.
   a. Does the course require students to engage in the analysis of problems and to demonstrate their ability to choose which formal numerical or symbolic system can be used to solve these problems? Yes / No
   b. What activities or assignments must students do to demonstrate this knowledge?
   c. What Specific Skills are the students evaluated on?

Applicant’s signature: Sterling Foster
Date: Sept. 11, 2015

Please submit this application to the CTE GenEd Sub-board Chair.
Requirments:

1. Promotes the recognition of formal numerical and symbolic systems and an understanding of what they represent.
   a. Does the course require students to demonstrate their knowledge of the meaning and use of formal numerical and symbolic systems? Yes / No
   Yes, besides the real numbering system, the course utilizes the symbolic system of trigonometry and vectors; students learn sine, cosine, and tangent trigonometric functions with their uses in triangles with Law of Sines and Cosines, the sine wave graphs with amplitude and period, the uses in vectors with magnitude and direction, and their overall application to the technical fields.

   b. What activities or assignments must students do to demonstrate this knowledge?
   Students will be required to demonstrate their knowledge on homework assignments, quizzes and exams. See some sample problems attached.

   c. What Specific Skills are the students evaluated on?
   The course SLOs are specific topics with skills which relate to various problems. These problems test the student’s understanding. See some sample problems attached.

2. Promotes an understanding of the basic operating principles or rules that govern the use of those formal systems.
   a. Does the course require students to demonstrate their understanding of the established rules and principles regarding how to use formal numerical and symbolic systems of representation? Yes / No
   Yes, using trigonometry as the foundation of the course, there are multiple principles and rules. To determine angles with trigonometry students must learn the unit circle, quadrant signs, reciprocal functions, and inverses. For right triangles, students learn to use SOH, CAH, TOA and x, y, r set-up to determine side lengths and angles. Also Law of Sines has possible problem cases depending on the given values and angle. Other more basic operating principles would be PEMDAS and Pythagorean formula.

   b. What activities or assignments must students do to demonstrate this knowledge?
   Students will be required to demonstrate their knowledge on homework assignments, quizzes and exams. See some sample problems attached.

   c. What Specific Skills are the students evaluated on?
   The course SLOs are specific topics with skills which relate to various problems. These problems test the student’s understanding. See some sample problems attached.

3. Promotes an understanding of the connection between real-world problems and their expression and solution in the language of formal systems.
   a. Does the course require students to apply an understanding of the use of formal symbols to how they apply to addressing real-world issues and problems? Yes / No
   Yes, since this course is specifically created to address higher mathematics in the trade fields, almost all of the SLO topics and skills directly relate to real-world problems. In trigonometry and vectors, solving triangle sides and angles are constantly used in the real-world from framing
trusses to course trajectories.

b. What activities or assignments must students do to demonstrate this knowledge?
Students will be required to demonstrate their knowledge on homework assignments, quizzes and exams. See some sample problems attached.

c. What Specific Skills are the students evaluated on?
The course SLOs are specific topics with skills which relate to various problems. These problems test the student’s understanding. See some sample problems attached.

4. Emphasizes the ability to analyze a problem and correctly select the means by which it can be solved.

a. Does the course require students to engage in the analysis of problems and to demonstrate their ability to choose which formal numerical or symbolic system can be used to solve these problems? Yes / No
Yes, within the course there are several multi-step problems, such as adding vectors and solving triangles with trigonometry, these type of problems take careful analytical skills to determine the correct steps to the solution. For example, Sin(x), Cos(x), and Tan(x), as well as their inverses, can have multiple values and angles. The students must analyze the sign and quadrant from the solution to identify the correct answer. Also when using Law of Sines the solution can be none, one, or even two possible triangles, forcing the students to analyze the results.

b. What activities or assignments must students do to demonstrate this knowledge?
Students will be required to demonstrate their knowledge on homework assignments, quizzes and exams. See some sample problems attached.

c. What Specific Skills are the students evaluated on?
The course SLOs are specific topics with skills which relate to various problems. These problems test the student’s understanding. See some sample problems attached.
CTE Quantitative and Logical Reasoning Category - Math 150

General Syllabus Information

Math 150 – Technical College Mathematics

Description:
Calculating geometric perimeters, areas, and volumes. Trigonometry ratios for angles and values. Solving right and oblique triangles with trigonometry. Graphing trigonometry and vectors. Adding vectors with trigonometry and determine component vectors. Solve applied work-related problems. (3 credit)

Proposed Textbook:
Introduction to Technical Mathematics, 5th edition; Washington, Triola, Reda

Proposed Calculator:
The TI-30XS Multiview ($15-20)

SLOs with corresponding book sections:
- Use a calculator to convert degrees-minutes-second and decimal degrees (6.1)
- Compute perimeters (6.2) and areas (6.3) of two dimensional figures, include multi-component figures
- Compute volume (6.4) of three dimensional right prisms, pyramids, cones, and spheres
- Solve for sides of the right triangle, using the Pythagorean Theorem (13.3)
- Recognize and use the special triangles: 30/60/90 and 45/45/90 (13.6)
- Define the trigonometric ratios of sine, cosine, and tangent in a right triangle (13.5)
- Demonstrate calculator usage with trigonometric (13.5) and inverse trigonometric functions (13.6)
- Calculate right triangle problems and applications using the sine, cosine, and tangent functions (13.7)
- Analyze vector quantities and scalar quantities in applications (14.4-14.6)
- Add, subtract, and negate vectors with components (14.6)
- Calculate vector components from the modulus and angle, using trigonometry (14.5)
- Convert measurements in degrees and radians (15.1)
- Solve problems with angular geometry, arc length, and sectors (15.2)
- Graph the sine and cosine waves by plotting points (15.3)
- Recognize from graphs of sine or cosine the amplitude (15.3) and period (15.4).
Topics from proposed textbook:

**Chapter 6 Intro to Geometry (will use a formula sheet)**
- 6.1 – Basic Geometric Figures
- 6.2 – Perimeter
- 6.3 – Area
- 6.4 – Volume

**Chapter 13 Geometry and Right Triangle Trig (will use a formula sheet)**
- 13.1 – Angles and Their Measure
- 13.2 – Other Geometric Figures
- 13.3 – Right Triangles and the Pythagorean Theorem
- 13.4 – Similar Triangles
- 13.5 – The Trigonometric Ratios
- 13.6 – Values of the Trigonometric Ratios
- 13.7 – Right Triangle Applications

**Chapter 14 Oblique Triangles and Vectors (will use a formula sheet)**
- 14.1 – Trigonometric Functions of Any Angle
- 14.2 – The Law of Sines (May include, if time)
- 14.3 – The Law of Cosines (May include, if time)
- 14.4 – Introduction to Vectors
- 14.5 – Vector Components
- 14.6 – Vector Addition

**Chapter 15 Graphs of Trig Functions**
- 15.1 – Radian Measure
- 15.2 – Application of Radian Measure
- 15.3 – Graphs of Sine and Cosine, with Amplitude and Reflections
- 15.4 – Graphs of Sine and Cosine, with Period, Amplitude, and Reflections