MATH 0000E - PRACTICAL MATHEMATICS

SECTION A

1. Division: Sciences & Mathematics
2. Subject Code: MATH
3. Course Number: 0000E
4. Course Title: PRACTICAL MATHEMATICS
5. Semester of First Offering: FALL 2015

SECTION B General Course Information

1.Units: 6.0 **Variable Units:** N/A
2.This Course is: Degree-Applicable Credit - Non-Transferable
3A. Cross-List: **3B. Formerly:**

Course Format and Duration

4. Standard Term Hours per Week		**5. Standard Term Total Semester Hours**	
Lecture/Discussion:	6	Lecture/Discussion:	108
Lab:		Lab:	
Activity:		Activity:	
By Arrangement:		By Arrangement:	
Total Hours per Week:	6	**Total Hours :**	108

6. Minimum hours per week of independent work done outside the class: 12

Course Preparation - (Supplemental form B required)

7a. Prerequisite(s): (Course and/or other preparation/experience that is REQUIRED to be completed previous to enrollment in this course.)

Completion of MATH 582 with grade of "C" or better or placement by matriculation assessment process

7b. Co-requisite(s): (Courses and/or other preparation that is REQUIRED to be taken concurrently with this course.)

7c. Advisory: (MINIMUM preparation RECOMMENDED in order to be succesful in this course. Also known as "Course Advisory".)

Catalog Description And Other Catalog Information:

8. Repeatability: **Not Repeatable**

Please note: Repeatability does not refer to repeating courses because of substandard grades or a lapse of time since the student took the course. A course may be repeated only if the course content differs each time it is offered and the student who repeats it is gaining an expanded educational experience as stipulated in Title V.

- ☐ Skills or proficiencies are enhanced by supervised repetition and practice within class periods.
- ☐ Active participatory experience in individual study or group assignments is the basic means by which learning objectives are attained.
- ☐ Course content differs each time it is offered.

Explanation for above repeatability selection:

9a. Grading Option: Standard Grade

9b. Catalog Description:

Practical Mathematics is a one semester course for non-math, non-science majors covering the topics of numeracy, proportional reasoning, algebraic reasoning, trigonometric reasoning, data analysis and critical thinking through real world applications. Students develop the skills needed to apply mathematical and technological skills and procedures to analyze and interpret mathematical data. Algebraic, geometric and trigonometric topics covered include: real numbers and their properties; proportions; measurement of lengths, areas and volumes; first degree equations and inequalities; functional analysis; graphs of linear, quadratic, and exponential equations; systems of equations in two variables; quadratic, exponential, and logarithmic equations; and basic right triangle trigonometry. Not intended for students on the calculus track.

Course Outline Information

10. Student Performance Objectives: (Performance objectives for all credit courses must indicate that students will learn critical thinking and will be able to apply concepts at college level.Performance objectives must be related to items listed in Section 11.)

Upon successful completion of this course, the students will be able to:

Numeracy
1.Execute basic order of operations and demonstrate the effects of common operations with signed numbers, fractions and decimals in both words and symbols.
2.Apply estimation techniques in a manner mathematically appropriate for the context of the situation.
3.Demonstrate the ability to measure and perform dimensional analysis with variety of units of measure such as length, area, volume and weight.
4.Demonstrate competency in the use of magnitude in the context of place values, fractions and numbers written in scientific notation.
5.Read, interpret and make decisions based upon data given including from line graphs, bar graphs, root graphs, exponential graphs, logarithmic graphs, scatter plots, charts, and tables.

Proportional Reasoning
6.Recognize and compare proportional relationships presented in different ways.
7.Apply quantitative reasoning to solve applied problems with proportional relationships.

Algebraic Reasoning
8.Understand the use of variables to represent quantities or attributes in a variety of forms such as equations, formulas, tables and graphs.
9.Describe the effects of changes in variable values on algebraic and basic trigonometric relationships.
10.Construct and solve equations and inequalities representing relationships involving one or more unknown quantities for applied problems.

Trigonometric Reasoning
11.Apply the Pythagorean Theorem in a variety of contexts to solve applied problems.
12.Estimate and measure angles and solve practical problems involving missing angle measurements.
13.Construct and solve basic right triangle trigonometric equations representing relationships that arise in a variety of applied settings.

Data Analysis
14.Translate data from a variety of sources including from line graphs, exponential graphs, logarithmic graphs, scatter plots, charts, and tables into mathematical representations.
15.Convert mathematical representations including linear, polynomial, root, exponential and logarithmic equations into visual, graphical interpretations.
16.Describe the behavior of common types of functions (including linear, polynomial, exponential and logarithmic) using words, algebraic symbols, graphs and tables.
17.Use appropriate terms and units to describe a rate of change for a variety of applied settings.
18.Identify the appropriate model for a given set of data and consider alternative models.
19.Demonstrate an understanding of the error involved when using mathematical models to estimate real world scenarios.

Critical Thinking
20.Use online and print resources to construct mathematical models, apply estimation techniques, analyze data and appraise validity of claims.
21.Operate appropriate mathematical tools such as calculators, computer algebra systems (CAS) and measuring tools to solve applied problems.
22.Demonstrate critical thinking by analyzing ideas, patterns and principles.
23.Demonstrate flexibility with mathematics through various contexts, modes of technology and presentations of information.

11. Course Content Outline: (Provides a comprehensive, sequential outline of the course content, including all major subject matter and the specific body of knowledge covered.)

1.Basic operations with Real Numbers
a.Convert between decimals and fractions
b.Work with signed numbers
c.Exponents and exponent rules
d.Order of Operations

2.Measurement
a.Measure length, area, volume and weight in both US customary units and metric units
b.Estimation techniques
c.Evaluation and application of accuracy needed for a specific situation
d.Dimensional analysis for length, area, volume weight
e.Apply skills to real world scenarios

3.Scale
a.Scientific, engineering and pre-fix notation
b.Determine or interpret the appropriate notation for applied situations
c.Compare numbers and quantities expressed in different formats
d.Perform operations on numbers given in scientific notation

4.Rates, Proportions & Percent
a.Percent
b.Rates of change
i.Appropriate units for rates of change
ii.Linear rates of change and slopes of lines
c.Interpret rates, proportions and percent from an applied context
d.Apply proportional analysis to set up equations and solve applied problems

5.Graphical Analysis
a.Cartesian Coordinate System
b.Independent/Dependent Variables and Axes
c.Generalize a pattern
d.Linear graphs
e.Polynomial graphs
f.Exponential graphs
g.Logarithmic graphs
h.Translations of curves and functions
i.Fit data with a curve
j.Use graphical analysis to describe a real world scenarios

6.Equations
a.Solve linear equations
b.Solve polynomial equations
i.Estimate solutions using quadratic formula
ii.Find solutions graphically
c.Solve exponential equations
d.Solve logarithmic equations
e.Formula manipulation for one variable using appropriate order of operations

7.Linear Relationships
a.Slopes as rates of change and with appropriate units for applied contexts
b.Given data determine if the relationship is linear and write equation
c.Use linear equations to model applied problems and make calculations

8.Functions
a.Given data determine if it represents a function
b.Use the appropriate mathematical model to turn data from a variety of types of sources into a mathematical function (linear, quadratic, exponential, logarithmic, etc.)

c.Determine domain and range of functions
d.Write linear functions using rate of change and data points
e.Properties of inverse functions

9.Systems of Equations
a.Solve systems of linear equations in 2 and 3 variables
b.Solve non-linear systems in 2 variables
c.Use graphical analysis to both estimate and solve systems of equations
d.Use Linear Programming to solve applied problems

10.Exponential and Logarithmic Relationships
a.Exponential rates of change
b.Given data determine if the relationship is exponential growth or decay
c.Use exponential equations to model applied problems and make calculations
i.Population growth and decay
ii.Compound interest
d.Logistical growth models
e.Inverse relationship between logarithms and exponential functions
f.Solve exponential and logarithmic equations

11.Trigonometry
a.Angle measurement
b.Pythagorean Theorem
c.Right triangle ratios
d.Use trigonometric analysis to solve real world problems

12. Typical Out-of-Class Assignments: (Credit courses **require** two hours of independent work outside of class for each lecture hour, less lab/activity classes. List type of assignments including library assignments.)

a. Reading Assignments: (Submit at least 2 examples.)

1. Find and read an article utilizing measurements in scientific or engineering notation. State the numbers used in the article in both the given scientific/engineering form and in the equivalent standard decimal format. Describe why the authors chose to describe the numbers in this format rather than in standard decimal notation.
2. Read an article describing the growth of different social media such as MySpace, Facebook and Twitter. Use the data given and a graphing calculator, Excel or a CAS (Computer Algebra System) to create a graph of each company's growth curve. Explain the type of growth experienced by each company, the factors that led to this growth and any conditions that did or will hinder future growth.

b. Writing, Problem Solving or Performance: (Submit at least 2 examples)

1. Using a nutrition label from a package of M&Ms, answer the following questions or prompts: What percent of calories are from fat? What percent of a person's daily allowance of carbohydrates will be consumed if you eat the entire package of candy? Describe in words process and the proportion you would set up to find the number of calories per M&M then determine this value.
2. Research the cost to purchase and use a new iPod. Clearly explain the parameters you choose and how they affect the overall cost. Write a linear model to describe this cost. Graph your linear model and describe in context the meaning of key linear components such as domain, range, y-intercept, and slope.

c. Other (Term projects, research papers, porfolios, etc.)

Material Cost Project: Determine the cost to manufacture a product of your choice. The materials you use and the type of manufacturing is your choice. You may construct/build, weld, sew, design, etc.
-Write a paragraph explaining your project, design, the tools needed and how you would manufacture this product.
-Create a blueprint of your project complete with measurements of each piece.
-On the blueprint, state each measurement in both US customary units and metric units.
-On the blueprint, state your measurements in both fractional and decimal equivalents. (Note: Your design must include at least 5 fractional measurement , you may not use only whole numbers)
-On a separate sheet of paper, determine exact amount of material needed to manufacture your product. Include all areas and volumes necessary to complete your design.
-Using technological resources, determine the cost to manufacture your product based on the amount of material needed.
Answer the following questions:
-- Can you purchase the exact amount of material needed? If not, what is the waste?
-- Would it be cheaper to produce more products?
-- What issues did you run into? How did you resolve these issues?

13. Required Materials:

a. All textbooks, resources and other materials used in this course are college level?

- ☑ Yes
- ☐ No

b. Representative college-level textbooks (for degree applicable courses) or other print materials:

Book 1:

Author:	Almy and Foes
Title:	Math Lit: A Pathway to College Mathematics
Publisher:	Pearson
Date of Publication:	2014
Edition:	1st

c. Other materials and/or supplies required of students:

14.Check all Instructional methods used to present course content:

- ☑ Lecture
- ☑ Discussion Semminar
- ☑ Lab
- ☑ Directed Study
- ☑ Activity
- ☐ Distance Education (requires supplemental form)
- ☐ Work Experience
- ☐ Tutoring

Other:

Give detailed examples of teaching methodology that relate to the course performance objectives:

1. In class lecture (Lecture/Discussion): Interactive lecture format will be used to perform data analysis, graph real world information and model the behavior with an algebraic equation. Data will be projected to the class and graphed through a Computer Algebra System (CAS). The class will discuss the trends in the data and which type of algebraic curve would best describe the data. Through lecture, discussion and demonstration the class guided by the instructor will develop the appropriate algebraic modeling equation.

Course Objectives Addressed: 14) Translate data from a variety of sources including from line graphs, exponential graphs, logarithmic graphs, scatter plots, charts, and tables into mathematical representations. 18) Identify the appropriate model for a given set of data and consider alternative models.

2. Small group collaborative learning activity (Laboratory/Activity): In small groups students will be asked to design and build a sealable container that will hold 3 ounces of popcorn. Each group will be given a piece of poster board, scissors, tape and a scale. There will be a large bag of popcorn at the front of the room but there is no measurement given on the bag. The instructor will move around the room observing and guiding groups as needed. At the end of the activity each group will get to test their container by pouring exactly 3 ounces of popcorn into the container to determine how close they met the criteria. As the groups are testing their containers, the instructor will facilitate a class discussion about the pros and cons of each design and the process of designing the containers.

Course Objectives Addressed: 2) Apply estimation techniques in a manner mathematically appropriate for the context of the situation. 21) Operate appropriate mathematical tools such as calculators, computer algebra systems (CAS) and measuring tools to solve applied problems.

15. Methods of Assessing Student Learning
15a. Methods of Evaluation:

- ☑ Essay Exam
- ☑ Objective Exam
- ☑ Projects
- ☑ Class Discussion
- ☑ Reports
- ☑ Problem Solving Exam
- ☐ Skill Demonstration
- ☐ Other

15b. (All courses must provide for measurement of student performance in terms of stated student performance objectives, Area 10, and culminate in a formal recorded grade based on uniform standards. Submit at least 2 examples.)

1.The following is an example of a classroom discussion that would lead into a group project started in class and finished for homework. The final product would be a group report turned in at the completion of the project. Student performance would be evaluated based on the detail provided about the students' specific project, each student's contribution to the group and the correctness of the solutions given.

As a class, the instructor will facilitate a discussion about the different ways to measure the height of very tall objects such as buildings or trees. If not brought up during the discussion, the instructor will introduce tools (including applications for cell phones) and mathematical formulas from trigonometry that can be used to determine heights and angles. The class will then take a field trip outside the classroom to find heights of specific objects around campus. The initial object measured will be demonstrated by the instructor and done together as a class. Then small groups will split off to find other objects around campus and determine the measurements necessary to find the height of the specified objects. The groups will use this data collection to complete an in class worksheet. At the end of class each small group will be given the following assignment:
a.Find five objects off campus and determine the heights of these objects, pick objects that would otherwise be difficult to measure them with standard measuring tools (i.e. do not use the bookshelf in your room).
b.List all five objects, along with the subsequent measurements you found necessary to determine the height of the object.
c.Show all equations and calculations used.
d. Write a conclusion paragraph about this project. Include your contribution to the group data collection, how accurate your measurements were and discuss any difficulties your group encountered.

2.The following is an example of a problem from an exam which would entail problem solving, written explanations and objective solutions. Student performance would be evaluated based on the correctness of the solutions given the specific data set and on the depth of understanding displayed in written explanations to the question asked in the problem.

Given the data set of Instagram users after 2010 (when Instagram was initially launched):
a.Identify the independent and dependent variables.
b.Graph the data on a Cartesian coordinate system and label your axes and intercept(s). Write a sentence or two to describe the intercept(s) in context of the data given.
c.Determine which type algebraic equation would best fit your data. Then find the appropriate equation.
d.Use the equation you found to predict the number of Instagram users in 5 years, in 10 years and in 100 years.
e.Does your algebraic model have restrictions in this context? Why or why not?

SECTION C

1. Program Information:

- ☑ In an approved program
- ☐ Part of a new program
- ☐ Not part of an approved program

2. TOP Code Information

Program Title: Mathematics, General 170100

3. Course SAM Code:

- ☐ A - Apprenticeship Course
- ☐ B - Advanced Occupational
- ☐ C - Clearly Occupational
- ☐ D - Possibly Occupational
- ☑ E - Non-Occupational

4. Faculty Minimum Qualifications/Degrees:

Mathematics

Comments:

SECTION D

General Education Information:

1. College Associate Degree GE Applicability:

Communication & Analytic Thinking

Math Competency

2. CSU GE Applicability:

3. IGETC Applicability:

4. CAN :

5. LDTP:

SECTION E

1. Articulation Information: (Required for Transferable Courses Only)

- ☐ CSU Transferable
- ☐ UC Transferable
- ☐ CSU/UC Major Requirement.

If CSU/UC major requirement, list campus and major. (Note: Must be lower division)

2. List at least one community college and its comparable course. If requesting CSU and/or UC transferability also list a CSU/UC campus and comparable lower division course

Pasadena Community College, California: Math 150 - Quantitative Literacy II

Rock Valley College, Illinois: Math 96A - Mathematical Literacy for College Students

SECTION F

Planning and Resources: Please address the areas below:

1. Evidence of Need or Potential: recommendations of advisory committee, connection to existing or planned degrees/certificates, or regional/national developments, transfer university requirements.

Math E will provide non-STEM students with an accelerated pathway through applicable curriculum to either a degree (it will meet the AA/AS degree requirement as equal in rigor to a Math D, Intermediate Algebra course) or to a transferable level course. Successful completion of Math E will gain students access to Math 10, 13 or 18, all three of which provide non-STEM majors a transferable level math class.

2. Appropriateness to Mission: connection to basic skills, transfer, career technical education, or lifelong learning; relations

Basic evaluation of the Math students currently in the Math 581/582 and A/D sequences are primarily non-STEM majors, as much as 65% over the 5 year period from 2009 to 2014. Accelerated pathways across the state are being created and tested for success. Initial results are promising for success and retention of students through the sequence of math courses.

Required as a prerequisite to Math D. (Math D is a prerequisite to any transferable mathematics course. Additionally, Math D meets the mathematics requirement for achieving an Associate Degree.)

The course will also provide CTE (Career and Technical Education) students with an applicable one semester math course to apply to an AA/AS degree in their chosen field.

3. Place in Program/Department: relationship to student learning outcomes identified by program, connection to general education, or articulation with other institutions.

Required as a prerequisite to Math D. (Math D meets GE applicability for Mathematics Competency and Communications and Analytical Thinking.) Math A includes all four Math program SLO's (Equations and Expressions, Visual Models, Applied Problems, Communication).

4. Availability of Faculty and Facilities: minimum qualifications to teach course, special training for instructors, or long-term physical impact of course.

All math faculty members meet the minimum qualifications to teach this course. No special training is required.
No additional resources are needed since we have the classroom space and technology already available.

5. Potential Impact on Resources: impact on library, computer support, transportation, equipment, or other needs

No additional resources are needed since we have the classroom space and technology already available.

SECTION G

1. Maximum Class Size (recommended): 35

2. If recommended class size is not standard, then provide rationale: