Hawai'i Community College
Certification for General Education: Purpose, Criteria & Procedures
approved by GECTT, 2-27-12

Purpose

The purpose of GE certification at HawCC:

- ensures consistent implementation of HawCC's General Education Philosophy; and
- ensures that certified courses provide evidence of academic rigor and consistency with regard to the course outline--course objectives, student learning outcomes and course description—by meeting stated General Education Learning Outcome descriptors.

The purpose of the General Education Committee (GEC) is to review applications in order to designate courses to be part of HawCC's General Education curriculum.

Criteria for Certifying Courses for General Education

All HawCC courses that are certified as GE must: (#1 & #2 are from Sept. 23, 2011 Senate-approved, as amended, resolution)

1. have a primary designation and at least three secondary designations, one of which is Critical Thinking and one of which is Critical Reading.
   a. *Primary designation:*
      i. Courses numbered 100 or higher:
      Course learning outcomes and course objectives must support all descriptors of the primary designation except for those in the Communication (#1) and Areas of Knowledge (#7) Learning Outcomes. For those designations, all descriptors for a subcategory must be met. (amended by Senate, Jan. 27, 2012)
      ii. Courses numbered lower than 100:
      Course learning outcomes and course objectives must meet all those descriptors designated as essential on the HawCC General Education Student Learning Outcome Descriptors of the primary designation.
   b. *Secondary designations:*
      i. Critical Thinking:
      All certified courses must have at least one course learning outcome and course objective that supports a Critical Thinking descriptor or have evidence that the content taught relies on the use of at least one (1) Critical Thinking descriptor.
      ii. Critical Reading:
      All certified courses must have at least one course learning outcome and course objective that supports a Critical Reading descriptor or have evidence that the content taught relies on the use of at least one (1) Critical Reading descriptor.
      iii. In addition all certified courses must have at least one course learning outcome and course objective that supports at least one other GE learning outcome designation descriptor, i.e. not the primary designation or Critical Thinking or Critical Reading.
2. include rigorous reading, written, or quantitative assignments (as appropriate) that evaluate the student learning outcomes.

Procedures

1. Complete the HawCC Course Outline. Include in #8 (Course Topics) details in outline format
2. Complete Attachment A with the signatures of all tenure-track faculty in the discipline (ie, those who teach or may teach the subject). Signatures indicate support for course being submitted for GE certification.
3. Submit the Course Outline with Attachment A to the Chair, General Education Committee
4. See the Signature Page of Attachment A (Section H.) for additional instructions.

University of Hawai'i – Hawai'i Community College
Course Outline

Math	135	Pre-Calculus: Elementary Functions
course alpha	course number	course title

1. Course Description:

Functions and relations; polynomial and rational functions; exponential and logarithmic functions; matrices; sequences and series. Instruction will be given on the use of appropriate technology to facilitate conceptual understanding of functions (numerically, graphically, symbolically, and verbally).

2. Number of Credit Hours: 4

3. Course Prerequisites and Concurrency: (Please check the box if the prerequisite may also be taken in the same semester as the proposed course.)

		May be taken concurrently
a.	"C" or better in Math 27 or placement in math 135	☐
b.	"C" or better in ENG 21 or placement in ENG 102	☐
c.		☐
d.		☐

4. Course Corequisites: (Course that must be taken in the same semester as the proposed course.)

a.	None

5. Recommended Preparation:

6. Student Learning Outcomes:

a. Upon completing the course, students will be able to:
1. Analyze the graphical and algebraic characteristics of functions, including polynomial, rational, exponential, and logarithmic.
2. Use mathematical modeling techniques to solve problems.
3. Utilize graphing technology to analyze functions.

7. Course Objectives

a.
1. Graph polynomial, rational, logarithmic, and exponential functions;
2. Solve equations algebraically and graphically with real and complex solutions;
3. Solve inequalities algebraically and graphically;
4. Solve higher degree equations;
5. Select the appropriate theorem or method to use to solve an equation most efficiently;
6. Identify the graphical and algebraic characteristics of functions, including polynomial, rational, exponential, and logarithmic functions;
7. Analyze the behavior of functions based on the characteristics of functions;
8. Represent solution sets using interval notation;
9. Use a graphing utility to solve equations, explore characteristics of functions, and visualize transformations.
10. Develop mathematical models that accurately describe scenarios presented in word form.
11. Evaluate the accuracy and reasonableness of results.

8. Course Topics:

a. I. Basic concepts from algebra and coordinate geometry

II. Functions:

A. Definition of function and function notation;

B. Differentiate between functions and non-functions for sets of ordered pairs, equations, graphs and descriptive statements;

C. Transformation of graphs of functions;

D. Four operations on functions and composition of functions;

E. Graph the basic functions (linear, quadratic, square root, cubic, cube root, absolute value and greatest integer)

F. Identify the properties of a function, such as domain, range, one-to-one, inverses.

III. Polynomial and rational functions

A. Use synthetic division, quadratic formula, and/or factoring to find the zeros of a polynomial function;

B. Use theorems to enhance the graphing of functions;

C. Use the properties of polynomial functions to sketch a graph:

1. Review of finding intercepts
2. Determine the end behavior of the polynomial function and at the zeros.

D. Use the properties of rational functions to sketch a graph:

1. Review of finding intercepts
2. Find asymptotes and the graphical behavior near the asymptotes
3. Determine the end behavior of the rational function

IV. Exponential and logarithmic functions

A. Exponential functions and their properties;

B. Common and natural logarithmic functions and their properties

C. Solve equations using exponential and logarithmic functions.

D. Solve application problems, such as for use in compound interest, exponential growth, calculating half-life, pH concentrations, intensity of earthquakes.

V. Selected topics:

A. Arithmetic and geometry sequences and series

B. Matrices and determinants

C. Intuitive limits

D. Nonlinear Systems of Equations

E. Mathematical Induction

F. Binomial theorem

G. Permutations and combinations

Adopted: June 1, 2006

Attachment A, Part I: HawCC Criteria for Transfer Courses
for the A.A. and A.S. Degrees only

CRITERIA FOR TRANSFER COURSES (Attach. III/IV, *CCCM 6100*)
Final decisions as to the academic level of a course should generally rest with the professional judgment of the faculty. Each of the items below indicates an area which should be considered in arriving at this judgment, although not all items pertain to all courses. It is important that judgments not be made by the "least common denominator" approach: the standard to keep in mind is the "typical" college transfer course, rather than the most borderline courses now accepted within the system.

1. Rate of progress expected of students.
High schools and colleges typically differ rather substantially in the quantity of material taught in a semester. The course in question should be compared with high school and college courses in related areas.

2. Basic skills (reading, writing and analytical) needed for success in the course.
The concern here is with the skill levels required of students rather than the level of material in the class. To be successful in most freshman transfer courses, a student must have a minimum of 10th grade skill level in the areas relevant to the course.

3. Amount and level of reading, writing or other independent work required.
As a rule of thumb, much of the reading material for a freshman level course should be at 12th or 13th grade level. Sometimes sophisticated ideas are presented in a simple writing style (such as the writing of Campus). In these cases, the level of the audience for which the materials were developed or who normally read them may be a useful indicator.

College courses usually differ from high school courses in the amount of reading, writing or other independent work required of students. The long standing rule of thumb for lecture classes is that students should spend two hours studying outside of class for every hour in class. For laboratory classes, a rule of thumb is that the student should spend three hours per week for each credit assigned to the class, with the student working independently or in groups for a substantial portion of the lab.

4. Amount and level of quantitative and logical reasoning required.
Where the course involves use of mathematics, a minimum of one year of high school algebra, or its equivalent, as background for the course would be required for transfer courses, (In the field of mathematics itself, courses through second year algebra are non-transfer.) Courses should also be examined for use of logical principles.

5. Conceptual level of the course.
Transfer courses generally stress theory, principles and concepts more than do non-transfer courses. They also move at least somewhat beyond recognition, recall and application to synthesis, analysis and understanding, although a major goal of many introductory transfer courses is mastery of the basic language and concepts of the discipline. Where a course focuses on teaching specific skills, it may be transfer level if it emphasizes the skills as applications of basic underlying principles and devotes considerable attention to understanding of those principles.

6. Background knowledge in related subject matter expected of students entering the course.
If a course is based on the expectation that-students will have completed normal high school courses in related areas it may be a transfer course (e.g,, high school physics as an expected preparation for a technical program). If the course has as a prerequisite, another course, which is itself transferable, and if the knowledge from the prior course is utilized in the course in question, the course should be transferable.

7. Level of mastery expected of students.
When the competencies attained in a course are sufficient to prepare students for further study in a related baccalaureate program, the course may be transferable. The relationship between the subject matter of the course and any related baccalaureate program area should be examined.

8. Is there a counter-part to this course on any four-year campus in the University system?
Although generally a course taught on four-year campuses would automatically be numbered 100 or above, it should be examined against other criteria as well. It is possible that some courses offered on four-year campuses should not be there. If such a case arises, we should challenge the appropriateness of that course on the four-year campus rather than blindly following their lead.

9. Is this course taught at or accepted by major accredited mainland colleges or Universities?
As in #8, the course should be examined against other criteria as well. Practice elsewhere is not sufficient justification for our numbering decisions.

Hawai'i Community College
Attachment A, Part II:
Form to be Submitted for General Education Certification
of Courses for the A.A. and A.S. Degrees only

A. Math (course alpha) | 135 (course number) | Pre-calculus: Functions (course title)

B. Effective semester & year for entering students (ie, semester & year of implementation): Fall 2013

C. General Education Student Learning Outcome being sought as the Primary Designation. All descriptors within a GELO must be supported.

Select: 6. Quantitative Reasoning

D. Based on the General Education Student Learning Outcome selected in C. (Primary Designation), list the specific course objectives and any relevant course student learning outcomes that support each of the descriptors in this GELO.

GE Student Learning Outcome Descriptors	Course Objectives (may provide supporting explanation as needed, after each one)	Course student learning outcomes (provide all that support the GELO descriptor)
Quantitative Reasoning - Apply mathematical concepts, methods, and problem-solving strategies to analyze, synthesize, and evaluate real-world problems in quantitative terms enables a student to...		
a. use appropriate modeling strategies to solve real-world problems arithmetically.	10. Use mathematical modeling techniques to solve problems using functions.	2. Use mathematical modeling techniques to solve problems using functions.
b. use appropriate modeling strategies, which include algebraic, statistical, estimation, inductive and/or deductive reasoning techniques.	2. Solve equations algebraically and graphically with real and complex solutions; 3. Solve inequalities algebraically and graphically; 4. Solve higher degree equations; 10. Use mathematical modeling techniques to solve problems using functions.	1. Analyze the graphical and algebraic characteristics of functions, including polynomial, rational, exponential, and logarithmic. 2. Use mathematical modeling techniques to solve problems using functions.

c. interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them. .	7. Analyze the behavior of functions based on the characteristics of functions; 10. Use mathematical modeling techniques to solve problems using functions.	1. Analyze the graphical and algebraic characteristics of functions, including polynomial, rational, exponential, and logarithmic. 3. Utilize graphing technology to analyze functions.
d. use symbols to express abstractions and manipulate symbols within a logical system.	2. Solve equations algebraically and graphically with real and complex solutions; 3. Solve inequalities algebraically and graphically; 4. Solve higher degree equations; 7. Analyze the behavior of functions based on the characteristics of functions; 9. Use a graphing utility to solve equations, explore characteristics of functions, and visualize transformations. 10. Use mathematical modeling techniques to solve problems using functions.	1. Analyze the graphical and algebraic characteristics of functions, including polynomial, rational, exponential, and logarithmic. 2. Use mathematical modeling techniques to solve problems using functions.
e. represent mathematical information symbolically, visually, numerically, and verbally.	1. Graph polynomial, rational, logarithmic, and exponential functions; 8. Represent solution sets using interval notation; 9. Use a graphing utility to solve equations, explore characteristics of functions, and visualize transformations. 10. Use mathematical modeling techniques to solve problems using functions.	1. Analyze the graphical and algebraic characteristics of functions, including polynomial, rational, exponential, and logarithmic. 3. Utilize graphing technology to analyze functions.
f. estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results.	7. Analyze the behavior of functions based on the characteristics of functions; 9. Use a graphing utility to solve equations, explore characteristics of functions, and visualize transformations. 11. Evaluate the accuracy and reasonableness of results.	1. Analyze the graphical and algebraic characteristics of functions, including polynomial, rational, exponential, and logarithmic.

E. Textbook(s) and/or other written material (can include electronic material):

a. List the textbook(s) and/or other written material to be used. (If no textbook is use, so state.) Indicate approximate portion of text to be used, if less than 75%.

Pre-Calculus Functions and Graphs, 4th Edition by Dugopolski or comparable textbook. Approximately half the contents of the textbook is used, since this course is the first semester of a two-semester sequence of pre-calculus courses.

b. Identify grade level of textbook(s) and/or other written material. Publishers can provide grade level for textbooks.

The level of reading required of students is at the college level.

F. List specific rigorous assignments/activities that are commonly required to evaluate student learning for all sections taught of this course. Identify the category by marking X in all that apply--*reading, writing, quantitative, or a combination*. HawCC uses the following to define academic rigor:

- **Reading**--Provide a description of rigorous student engagement in the critical reading process. For example: quantify number of pages or percentage of textbook read (written at 12th/13th grade level), provide the number of scholarly articles read (with a minimum of 5 bibliographic references per article), or describe the nature and length of other assigned readings.
- **Writing**--Provide a description of rigorous student engagement in the writing process. For example: give the number of pages written over the semester or describe the nature of the paper--research, observation, journal, etc.
- Q**uantitative reasoning**-- Provide a description of rigorous student engagement in the quantitative reasoning process. For example: provide the number and nature of mathematical problems (at least above one year of high school algebra); describe the extent and nature of data collection and analysis or mapping projects.

Describe assignments/activities that show rigorous student engagement--include assignments/activities of same type in one row—(mark X for all that apply—reading, writing, quantitative):	Reading	Writing	Quantitative
The pre-requisites for this course require successful completion of at least two years of high school algebra. Students are required to think critically utilizing previously accumulated concepts in previous math courses to analyze, integrate, and solve problems that are at the college level. The content of this course is designed to assure that a successful student should be prepared for the next course, which is the second-half of Precalculus, followed by Calculus I. With every topic covered the students will be required to complete related problem sets of a quantitative nature.	☐	☐	☒
The Precalculus textbook is at the college level of reading. Students are required to cover the topics of functions, polynomial and rational functions, exponential and logarithmic functions, and other selected topics, which spans coverage of four to five chapters of a standard textbook on pre-calculus. Additionally, assignments will include application problems from science and business which are presented in paragraph form and requires technical and analytical reading.	☒	☐	☐

Enter text.	☐	☐	☐
Enter text.	☐	☐	☐

G. Secondary Designations:

- For the first of 3 required General Student Learning Outcome designations--critical reading--select at least one descriptor that the course supports, copy it into the table below and include either a supporting course objective and supporting course student learning outcome, or content evidence.

c. analyze, organize, evaluate, and synthesize ideas from textbooks, periodicals, literature, and electronic sources.

Critical Reading - Read critically to synthesize information to gain understanding enables a student to...
c. analyze, organize, evaluate, and synthesize ideas from textbooks, periodicals, literature, and electronic sources.
Supporting Course objective and Supporting Course SLO:
2. Use mathematical modeling techniques to solve problems using functions. (In order to accomplish this outcome, it is expected that the students will acquire knowledge and understanding from the text in the form of explanations, definitions, theorems, examples, and problem sets.)
5. Select the appropriate theorem or method to use to solve an equation most efficiently; 10. Use mathematical modeling techniques to solve problems using functions.
OR Content evidence (i.e., assignments/activities)
Enter Text

- For the second of 3 required General Student Learning Outcome designations--critical thinking-- select at least one descriptor that the course supports, copy it into the table below and include either a supporting course objective and supporting course student learning outcome, or content evidence.

f. apply problem-solving techniques and skills, including the rules of logic and logical sequence.

Critical Thinking - Make informed decisions through analyzing and evaluating information enables a student to...
f. apply problem-solving techniques and skills, including the rules of logic and logical sequence.
Supporting Course objective and Supporting Course SLO:
1.. Analyze the graphical and algebraic characteristics of functions, including polynomial, rational, exponential, and logarithmic.
2. Solve equations algebraically and graphically with real and complex solutions; 3. Solve inequalities algebraically and graphically; 4. Solve higher degree equations; 5. Select the appropriate theorem or method to use to solve an equation most efficiently; 6. Identify the graphical and algebraic characteristics of functions, including polynomial, rational, exponential, and logarithmic functions; 7. Analyze the behavior of functions based on the characteristics of functions;
OR Content evidence (i.e., assignments/activities)

- For the third of 3 required General Student Learning Outcome designations—anything other than the primary designation, critical reading and critical thinking—select at least one descriptor that the course supports, copy it into the table below and either a supporting course objective and supporting course student learning outcome, or content evidence.

5. Technological Literacy

Technological Literacy - Employ computer technology to perform academic and professional tasks enables a student to...
a. demonstrate proficiency in using computer software such as that used for word processing, spreadsheets and presentations. b. apply knowledge of security, ethical, and legal standards while using technology. c. use communication technologies such as e-mail, discussion boards and video-conferencing. d. use basic terminology associated with technology.
Supporting Course objective and Supporting Course SLO:

Technological Literacy - Employ computer technology to perform academic and professional tasks enables a student to...
a. demonstrate proficiency in using computer software such as that used for word processing, spreadsheets and presentations.
SLO 3. Utilize graphing technology to analyze functions.

9. Use a graphing utility to solve equations, explore characteristics of functions, and visualize transformations.

OR Content evidence (i.e., assignments/activities)

- Optional--additional secondary designations beyond the required 3 may be chosen. Please write in the additional General Education Learning Outcome, the descriptor and the supporting evidence for each.