University of Hawaii Community Colleges
Proposal to Initiate, Modify or Delete a Course

1. Type of Action
   - A. Addition
   - B. Deletion
   - C. Modification
   (click and type to specify)

2. New Alpha, Number and Title
   Math 112 - Mathematics for Elementary Teachers II

3. Credits *

4. Old Alpha, Number and Title

5. Credits *

6. New Catalog Description
   Math 112 is the second of a two-course sequence designed to give prospective elementary education majors the depth of understanding necessary to teach mathematics in the elementary classroom. Topics include the representation of and operations on the natural numbers, integers, rational numbers and real numbers, and properties of those operations. Emphasis will be on communication, connections and problem solving, and reasoning.

7. Select box and type specific information in text box.
   - Prerequisites
   - Corequisites or Recommended Preparation
   - "C" or better in Math 111

8. Student Contact Hours Per Week
   - Lecture: 3 hours
   - Lecture/Lab
   - Lab
   - Other (click to specify)

9. Proposed Date of First Offering
   - Semester: Spring
   - Year: 2007

10. This course is proposed for the Liberal Arts Program. This course can fulfill Math or Logical Thinking requirement. If Other, specify Symbolic Reasoning (FS) requirement.

11. This course Makes No Difference in the number of credits required for the program/core.

12. Equivalent or similar courses offered in the UH System:

<table>
<thead>
<tr>
<th>Campus</th>
<th>Alpha, Number, Title</th>
<th>Campus</th>
<th>Alpha, Number, Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HawaiiCC</td>
<td>Math 112 - Mathematics for Elementary Teachers II (4 credits)</td>
<td>LeewardCC</td>
<td>Math 112 - Mathematics for Elementary Teachers II (3 credits)</td>
</tr>
<tr>
<td>KapiolaniCC</td>
<td>Math 112 - Mathematics for Elementary Teachers II (3 credits)</td>
<td>MauiCC</td>
<td>Math 112 - Mathematics for Elementary Teachers II (3 credits)</td>
</tr>
<tr>
<td>UH Hilo</td>
<td>Math 108 - Mathematics for Education II (4 credits)</td>
<td>UH Manoa</td>
<td>Math 112 - Mathematics for Elementary Teachers II (3 credits)</td>
</tr>
</tbody>
</table>

13. This course is (check one and click in appropriate textbox and provide details):
   - Already articulated with
   - Provide details of existing or desired articulation (date, college(s), purposes, pre-major, etc.) in this space:

   - Appropriate for Articulation with UH Manoa, UH Hilo, UH WO, Leeward CC, Kapiolani CC, Maui CC, and Hawaii CC
   - Provide details of existing or desired articulation (date, colleges(s), purposes, pre-major or major, etc.) in this space:

14. Reason for Initiating, Modifying or Deleting Courses or Other Pertinent Comment:
   To align and articulate with similar offerings at LCC, KCC, MCC, HawCC, UH H, and UHM (systemwide agreement, September 18, 2004).
   To provide the math course that satisfies the new College of Education's Elementary Education program Symbolic Reasoning (FS) requirement.

Requested by: [Signature]
Department Chairperson
Date: 9/11/06

Approved by: [Signature]
Curriculum Committee Chairperson
Date: 9/28/06

Dean of Instruction
Date: 10/2/06

Chancellor
Date: 10/63/06

CCCM #6100 (Amended for WCC use October 2002)
University of Hawaii Community Colleges
Proposal to Initiate, Modify or Delete a Course

Levels of Review of Course Proposal at Windward Community College

Course Alpha, Number, and Title:

Signatures

1. Department Area (more than one departmental instructor's signature required)
   
   Department Chairperson

   Was this course discussed in a department meeting? ☑ Yes ☐ No

2. Department

   Department Chairperson

   9/11/06

3. Division

   9/12/06

4. Curriculum Committee Review

   Approved ☑

   Disapproved ☐

   Reason:

   Curriculum Committee Chairperson

   Sept. 28, 2006

CCCM #6100 (Amended for WCC use October 2002)
Foundations Course Articulation Proposal
for a UH course to satisfy a UH Mānoa Foundations requirement

The UHM Foundations Board invites UH campuses to propose that an undergraduate course will articulate as satisfying a UH Mānoa Foundations requirement. The UHM Foundations Board will review all proposals to ensure that approved courses meet Foundations Hallmarks. If clarification is needed, a Board member will contact the division or department chair. If the Foundations Board and the General Education Committee approve the proposal, all sections of the course will articulate as satisfying the requirement for five years.

Send this form and the requested information to
Office of the Vice Chancellor for Academic Affairs, University of Hawai‘i at Mānoa
Attn: Helene Sokugawa
2500 Campus Road, Hawai‘i Hall 209
Honolulu, HI 96822
Fax to 956-7115

OCT - 9 2006

Replaced form, "Proposal to Initiate, Modify or Delete a Course": Catalog description modified.
Corrected section of Course Outline: "Course Content and Approximate Time to Be Spent on Each Topic."

REQUESTED INFORMATION

1. Course information. Campus [W] Subject [MATH] Course number [112]
If the course is cross listed, please provide the cross listing: Subject [ ] Course # [ ]
Course title: ____________________________

2. Foundations area requested. Check one.
☐ Written Communication ☑ Symbolic Reasoning ☐ Global & Multicultural Perspectives

3. Official course description. The course description must be consistent with the Hallmarks of the Foundations area. Submit a copy of the course description from the campus catalog.
   If the course is new or being modified, submit a copy of the form to create/modify a course. The completed form must be signed by the approving campus authority.

4. Syllabus. Submit a master syllabus. If multiple instructors teach the course and use varying texts and/or assignments, include three representative syllabi.

5. Assessment. Provide a brief explanation of how the department will demonstrate in five years that this course has been meeting the Foundations Hallmarks.

6. Application questions. Provide the requested information for the Foundations area (see page 2).

7. Signatures. Division or department chair and chief academic officer signatures are required.
   Division/department chair's printed name ____________________________
   Division/department chair's signature ____________________________ date
   Div./dept. chair's email ____________________________
   Campus address ____________________________ campus phone ____________________________
   Chief academic officer's printed name ____________________________
   Chief academic officer's signature ____________________________ date
Maui Community College — Articulation Proposal — MATH 112
November 2004

This course is currently going through the curriculum process at Maui Community College. Copies of the completed form will be forwarded upon campus acceptance.

This course is being created under the guidance of Joel Weiner at University of Hawaii, Manoa. As the first class has not been offered, a syllabus has not been created. The syllabus will be sent to Joel Weiner for suggestions and approval prior to the class being offered at this campus.

5. Assessment. Throughout the five year period, on going discussions with others teaching this course will be occurring. Common assessments will be used and critiqued. There is intent to create an email list for all campuses in the system using these common materials, etc.

6. Application questions: follow. The hallmark descriptions are the ones agreed to at the September 18, 2004 system meeting.

See Joel Weiner's Descriptions

[Note from gen ed office: WCC plans to offer Math 112 in Spring 2007.]
A DESCRIPTION OF HOW MATH 112 MEETS THE FOUNDATI
HALLMARKS

1. Students will be exposed to the beauty, power, clarity and precision of
formal systems. How will the course meet this hallmark?
The natural numbers, the integers, the rationals and the reals, each
with its standard operations, are excellent examples of formal systems.
Either they will be introduced axiomatically as is the case for the natu­
ral numbers or they will be introduced to model a variety of situations
that occur, for example, in business, physics and geometry that have
certain common intrinsic characteristics. We will use the power, clar­
ity and precision of these formal systems to establish many properties
of these systems, some quite deep properties. Most importantly, the
clarity and precision of these systems will open them up to very inter­
esting comparisons allowing us to use what we learned about one to
understand another more easily; this more than anything displays the
power of formal systems. The natural numbers with their operations
will be built on a couple of axioms about counting the elements of a
set; if there is beauty in simplicity then the students will see this kind
of beauty as we define and examine the four standard operations on
the natural numbers.

2. Instructors will help students understand the concept of proof as a
chain of inferences. How will the instructors help students understand
this concept?
The instructors will present proofs from time to time, e.g. that there
exist infinitely many primes or that there exist numbers beside the
rationals. However, more importantly, the students will engage in the
act of discovering and writing proofs. Often this will take the form of
the students presenting a conjecture followed by the struggle to see if
the conjecture is indeed true; if the conjecture is discovered to be false
the student will be expected to provide a proof that confirms that; if
the conjecture is true, then the student will be expected to provide a
proof that confirms that. From time to time the students will be asked
to use previous "more basic" results to establish more sophisticated
results based on those earlier results; this will require the presentation
of a proof.
3. Instructors will teach students to apply formal rules or algorithms. *How will instructors meet this hallmark?*
   Students will be given reading assignments that present formal rules. The students will be asked to questions about those rules and their responses will be carefully corrected, with special attention being given to showing them how well they applied the rules, and sometimes graded. This will happen on almost a daily basis. They will learn from their experiences how to apply formal rules.

   One formal meta-rule that will be taught will be to use units when dealing with fractions that come from word problems. If the units combine in the appropriate "common sense" manner when a particular operation is chosen to solve a problem, then the student ought to feel that he/she has chosen to do the word problem in the correct way. A simple example of this might be the following: if the quantities in the problem, for example, are miles per gallon and miles per hour, one would not want to add or subtract since the units are different; chances are that one wants to multiply or divide. Again, by multiplying and dividing the units one ought to be able to decide what the appropriate operation to use is.

4. Students will be required to use appropriate symbolic techniques in the context of problem solving, and in the presentation and critical evaluation of evidence. *What symbolic techniques will be required and in what contexts? How will presentations and evaluations of evidence be incorporated into this course?*

   One constant refrain of this course is to state anything of consequence bother verbally and symbolically. We want the students to recognize that it is to their own advantage to be able to do so to deal with the material that they are asked to digest. In fact, on at least one occasion, when the students study some knot theory that can be used to model the integers, the students will be asked to come up with their own symbolic representation of a concept and to use that symbolic representation to explain what they assert about the concept is indeed so.

5. The course will not focus solely on computational skills. *What reasoning skills will be taught in this course?*

   Students will be asked to infer from a collection of examples what may
be true in general. Students will learn techniques to refute conjectures and to use deductive methods of proof to establish that these conjectures are true. Proof by contradictions will be presented and students will be asked to write a few proofs that require that technique. While inductive proofs will not be presented or worked with in any formal way, students will be encouraged to use iterative methods where appropriate “to establish” that some formula is true in general.

6. Instructors will build a bridge from theory to practice and show students how to traverse this bridge. How will instructors help students make connections between theory and practice?
One example of making such connections occurs with the natural numbers. Based on an axiomatic development we discover and prove a variety of properties and symmetries for the four standard operations. Generally, each of these properties or symmetries has some explicit utilities in the computational realm. For example, their are a variety of tricks for carrying out certain kinds of subtraction and division problems that take advantage of a symmetry to change the given problem into a much simpler problem of the same kind with the same result. Say you wanted to subtract 298 from 422. Adding 2 to each of these numbers will not change the difference; this observation reflects a symmetry for subtraction. Thus, using this symmetry, we can subtract 300 from 424 to find the same result. This last subtraction is easy, easy enough for anyone to do in their head.
REFERENCE AND SUPPLEMENTARY MATERIALS

List materials that may be found in the library that will contribute to the course.

COURSE REQUIREMENTS

List any projects, field trips, experiments, reports, independent work, etc., which will be required or expected of students for the course.

EVALUATION

Methods of evaluation vary from instructor to instructor. Generally, methods of evaluation involve a combination (or all) of the following: in-class work, quizzes, homework assignments, projects, group activities, unit exams, and a final exam.

Suggested grading scale:
- 90-100%  A
- 80-89%   B
- 70-79%   C
- 60-60%   D
- Less than 60% F

Whatever method of evaluation is used, it is understood that the instructor reserves the right to make necessary and reasonable adjustments to the evaluation policies outlined. It is to be understood that every instructor will clearly inform students on the course syllabus what percentages are to be used to weight the course work and the grading scale used.

Identify methods of evaluation which will be employed to determine if the course objectives are being met (e.g., written examinations, attendance, projects). Specify the grading procedure to be used in the course.