The Honolulu Community College Foundations Board will review all proposals to ensure that approved courses meet Foundations Hallmarks. If clarification is needed, a Board member will contact you. If the Foundations Board and the General Education Committee approve the proposal, all sections of the course will be designated as satisfying the requirement. The course will be reviewed every five years.

1. Course information. Course Alpha PHIL Course Number 110

If the course is cross listed, please provide the cross-listing: Alpha Number

Course Title:

2. Foundations area requested. Check one.
Global & Multicultural Perspectives [ ] Symbolic Reasoning [x] Written Communication [ ]

3. How many instructors currently teach this course? It makes a difference if there are only one or two instructors teaching this course versus ten instructors teaching this course. This question is asked to get an idea of how many instructors the department needs to communicate with to discuss this foundation course.

4. Syllabus. Submit a master syllabus. If multiple instructors teach the course and use varying texts and/or assignments, please include multiple representative syllabi for comparison. (Three is recommended.)

5. Hallmark Requirements. Provide an explanation of how each of the hallmarks for this proposed Foundation course will be satisfied. Try to completely answer how the course intends to meet each particular hallmark. Referencing assignments, tasks, and evaluations used in the course (as stated on the syllabus /syllabi being submitted) as supporting evidence would be very helpful. See the previously submitted Religion 150 application for examples located at http://honolulu.hawaii.edu/intranet/articulation/foundations/REL150.pdf

6. Assessment. Provide a brief explanation of how the department will periodically review that this course has been meeting the Foundations Hallmarks including a description of what kinds of evidence will be collected to demonstrate this (Knowledge Survey results, sample of exam responses, writing samples, etc.). Also include a detailed description of how the department plans to have all instructors of this course share information with each other regarding how the hallmarks have been met. Please include a brief explanation of the assessment tools you will use to make this determination (such as Knowledge Surveys, Exams, Projects, Portfolios, etc.) and how you will use the results to make course improvements.

7. Signatures. The signatures of the initiator and the initiator’s Division Chair are required. The completed proposal must be routed to the Chair of the CPC before being delivered to the chair of the Foundations Board. No action on the part of the CPC is required unless the proposal also includes a new course Curriculum Action or a course modification Curriculum Action. The “routing” is a courtesy to the CPC. Signatures indicate approval/acceptance.

Initiated by: Ross Egloria
Initiator’s signature

Initiator’s printed name

Approved by: Jennifer Higa-King
Division Chair’s signature

Division Chair’s printed name

Routed via: Kara Kanani
CPC Chair’s signature

CPC Chair’s printed name

Accepted by: Steven T. Mandracchia
Foundation Board Chair’s signature

Foundation Board Chair’s printed name

Date

3/5/2015
Application Questions for Foundation Hallmarks (Hallmarks in bold)  
Explanatory Notes for each hallmark are at http://honolulu.hawaii.edu/intraneUarticulation/foundations/hallmarks.html.

**SYMBOLIC REASONING (FS):** To satisfy the FS requirement, a course will

1. **expose students to the beauty, power, clarity and precision of formal systems.** *How will the course meet this hallmark? How will you assess this and provide evidence that students are meeting this hallmark?*  
   See attached.

2. **help students understand the concept of proof as a chain of inferences.** *How will instructors help students understand this concept? How will you assess this and provide evidence that students are meeting this hallmark?*  
   See attached.

3. **teach students how to apply formal rules or algorithms.** *How will instructors meet this hallmark? How will you assess this and provide evidence that students are meeting this hallmark?*  
   See attached.

4. **require students 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 the course? How will you assess this and provide evidence that students are meeting this hallmark?*  
   See attached.

5. **include computational and/or quantitative skills.** *What reasoning skills will be taught in the course? What computational and/or quantitative skills will be taught in the course? How will you assess this and provide evidence that students are meeting this hallmark?*  
   See attached.

6. **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? How will you assess this and provide evidence that students are meeting this hallmark?*  
   See attached.
Application Questions for Foundation Hallmarks (Hallmarks in bold)
Explanatory Notes for each hallmark are at http://honolulu.hawaii.edu/intranet/articulation/foundations/hallmarks.html.

SYMBOLIC REASONING (FS): To satisfy the FS requirement, a course will

1. expose students to the beauty, power, clarity and precision of formal systems. How will the course meet this hallmark? How will you assess this and provide evidence that students are meeting this hallmark? See attached.

2. help students understand the concept of proof as a chain of inferences. How will instructors help students understand this concept? How will you assess this and provide evidence that students are meeting this hallmark? See attached.

3. teach students how to apply formal rules or algorithms. How will instructors meet this hallmark? How will you assess this and provide evidence that students are meeting this hallmark? See attached.

4. require students 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 the course? How will you assess this and provide evidence that students are meeting this hallmark? See attached.

5. include computational and/or quantitative skills. What reasoning skills will be taught in the course? What computational and/or quantitative skills will be taught in the course? How will you assess this and provide evidence that students are meeting this hallmark? See attached.

6. 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? How will you assess this and provide evidence that students are meeting this hallmark? See attached.
3. **Number of Instructors**

Normally two instructors teach this course. Occasionally due to scheduling issues related to course cancellations for a lecturer, a third instructor will teach this course. The instructors for this course collaborate consistently. See below on assessment.

4. **Syllabus** – see attached.

All instructors use the same syllabus.

5. **Hallmark Requirements**

**Introduction**

Prior to 2000 the Manoa core category that Philosophy 110 fulfilled was called Quantitative Reasoning. Only two disciplines were used by students to fulfill this core requirement—Mathematics (mostly MATH 100) or Philosophy 110. Students could also take PHIL 445 or a higher Math course.

The senior instructor at HCC played a leadership role in developing the FS category and hallmarks when, in the late ‘90s, many in the UH system believed that the old core was seriously out of date and irrelevant to the real world. Most problematic was the compartmentalization of the core and lack of connections between disciplines in the curriculum. As a follow-up to initial system conferences, several additional area-specific meetings took place to revise the core. For the quantitative reasoning group or what ultimately became the FS group, the first meeting included professors of mathematics, philosophy, computer science, economics, and linguistics.

The focus was to establish a more inclusive category of content to meet the skills for core. It was noted that the essence of mathematics and logic was the ability
to abstract patterns, put those patterns into symbols, and devise sophisticated ways to reason with symbols. The essential connection between Boolean algebra and propositional logic was discussed as an example, and the use of the crucial concept of variables in algebra, symbolic logic, and set theory was noted. Noted by the professors in computer science, economics, and linguistics was the fact that many disciplines have devised symbolic ways of representing patterns and reasoning symbolically. It did not take long for the committee members to focus in on the crucial notion of proof in any discipline that uses symbolic reasoning.

When the new core was adopted by the Board of Regents, the senior instructor at HCC worked on a multi-campus articulation agreement, and PHIL 110 at HCC was one of the first courses to be articulated under that agreement. Over the intervening years, the senior instructor has participated in several system meetings to create and revise the explanatory notes for FS; the most recent system effort was to revise hallmark #5.

With this background, the content of the hallmarks should be clearer.1

SLO’s From Syllabus

1. **Course Description and Course Objectives and Student Learning Outcomes**

The course develops basic techniques of analysis and an understanding of the principles and concepts involved in clear thinking. Emphasized will be logical validity, deductive and inductive reasoning, fallacious arguments, symbolic logic, and scientific method as applied to criteria of reasonable evidence.

Students will

- demonstrate an understanding of the beauty and power of symbolic systems, as well as their clarity and precision, through use of techniques of logical and quantitative analysis, with the intention of enhancing reasoning skills and appreciation of abstraction, pattern recognition, and formal systems of analysis;

- demonstrate an understanding of the concept of logical proof as a chain of inferences by producing symbolic chains of inferences of

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1 Introduction written by Ronald C. Pine, edited by UCollege Dean Marcia Roberts-Deutsch. Language approved by Judy Sokei, Chris Ann Moore, and DC Jennifer Higa-King.
their own;

- demonstrate skill in hypothetical reasoning, and gain experience in the presentation and critical evaluation of evidence;

- demonstrate an ability to use symbolic techniques and formal rules in the context of problem solving by applying symbolic analysis techniques (translating, formal proof, truth tables, argument pattern recognition, quantification) both to informal (fallacies, inductive arguments) and formal reasoning.

**Hallmark and SLO Mapping**

**Hallmark 1: Expose students to the beauty, power, clarity, and precision of formal systems** \(\rightarrow\) SLO 1

**Hallmark 2: Help students understand the concept of proof as a chain of inferences** \(\rightarrow\) SLO 2

**Hallmark 3: Teach students how to apply formal rules or algorithms** \(\rightarrow\) SLOs 1 and 4

**Hallmark 4: Require students to use appropriate symbolic techniques in the context of problem solving, and in the presentation and critical evaluation of evidence** \(\rightarrow\) SLO 4

**Hallmark 5: Include computational and/or quantitative skills** \(\rightarrow\) SLOs 1 and 4. (See discussion below.)

**Hallmark 6: Build a bridge from theory to practice and show students how to traverse this bridge** \(\rightarrow\) SLOs 1-4 (See discussion below.)

**SR Hallmarks and Sample Content**

**Hallmark 1: Expose students to the beauty, power, clarity and precision of formal systems**

Student appreciation of abstraction and formal pattern recognition for the usefulness of symbolic and mathematical reasoning, and enhancing critical thinking ability, are a vital part of the course. Seeing patterns of reasoning are shown to be intimately connected to logical and symbolic analysis and the evaluation of inferences. The concept of a variable plays a major role throughout the course.
Tools of formal pattern recognition are applied throughout the course, even with content such as informal fallacies that has traditionally been thought of as more relevant to a non-symbolic critical thinking course.

Students are first shown (and must later apply to do well on quizzes and exams) that many arguments (valid or invalid) have basically the same form.

Eg. 1-1

All people who voted for Obama in 2008 support health care reform. George the plumber did not vote for Obama in 2008. Therefore, George the plumber does not support health care reform.

Eg. 1-2

All people who live in the city of Honolulu also live on the island of Oahu. Kanoe does not live in the city of Honolulu. So, Kanoe does not live on the island of Oahu.

For any x, if x is an A, then x is a B. k is not an A. So, k is not a B.

These arguments are then presented again later in the course when skills in quantification logic are developed.

\[(x)(Ax \supset Bx)\]
\[\sim Ak \therefore \sim Bk\]

Most students will have an easy time seeing that the second argument as invalid but have a hard time on the first one. Abstract patterns are advertised as the secret behind the scenes so to speak.

Next, students are shown that even in informal contexts, underlying patterns can be used to evaluate reasoning and evidence. For instance, students are shown formal “recipes” to use as guides to critique arguments such as the following:

Eg. 1-3

*It is wrong to believe that our troops in Iraq are there as Bush claims to assure a “transition to democracy.”* Democracy? Give me a break.
Creating a democracy in Iraq with all the religious factions there that have no understanding of civic debate and democratic principles is like building a plane during takeoff.

Questionable Analogy Recipe: (Students use this recipe to formally examine the above argument)

Conclusion: X is bad (Or, X is good.)

Premise #1: X is just like Y.

Premise #2: Y is bad (Or, Y is good.) (usually implied)

Label & Description: Questionable Analogy. A weak analogy is used in the premise (indicate what is being compared to what).

Argument Analysis: Presumption. Just because a creative analogy is used in the premise we should not presume that evidence is offered for the conclusion. By way of summation or introduction, creative analogies can help us understand an argument, but unless the characteristics of similarity are discussed and justified, bare analogies should not be considered evidence. Critique the specific analogy. Indicate what evidence is left out that would make the analogy stronger. Indicate how the two things being compared are dissimilar.

Eg. 1-4

"If the Supreme Court says that you have the right to (homosexual) sex within your home, then you have a right to bigamy, you have the right to polygamy, you have a right to incest, you have the right to adultery. You have the right to anything." United States Senator Rick Santorum, R-PA

Assume that Santorum's implied conclusion is: "The Supreme Court should not say that you have the right to (homosexual) sex within your home."

Slippery Slope Recipe: (Students use this recipe to formally examine the above argument)

Conclusion: Don't do A. (Most often implied.)

Premise #1: Because if we do A, then B will happen. If B happens, then C will happen. And if C happens, then D happens. (The chain here
does not need to be exactly this long, but usually it at least involves an A, B, and C.)

Premise #2: D is bad (usually implied).

Label & Description: Slippery Slope. There is an unsupported slippery slope in the premises. One of the premises claims that once a first step is taken a number of other steps are inevitable.

Argument Analysis: The premise is questionable and unfair. Although the reasoning is valid, an unsupported and controversial prediction is made in the premises regarding a possible chain of causal events. Without some evidence presented to support the connections asserted in the premise, the mere assertion of a possible chain of events cannot support the conclusion. Focus on whether the premise is a reliable belief. Argue that it is at least questionable by offering evidence that the chain is not likely to happen. Point out that the argument could be stronger if inductive evidence was offered to support this premise.

Eg. 1-5

If it were not for the liberal media that emphasizes only negative activity in Iraq and demonstrations against the war, we would be winning this war. Before the liberal media started their negative feeding frenzy and the demonstrations started, we were winning. After they started, we began to lose.

Questionable Cause Recipe: (Students use this recipe to formally examine the above argument)

Conclusion: A caused B.

Premise: A happened, then B happened.

Label & Description: Questionable Cause. The conclusion asserts a causal connection between two events, but only a time sequence of those events is noted in the premise.

Argument Analysis: Reasoning. Although the premise is relevant to the conclusion, it is insufficient to support the conclusion. Make a case for a weak inductive inference by indicating that other factors were also happening at the same time as the alleged cause. Describe what type of evidence and investigation would be needed to make the causal connection claim stronger.
Students are shown that one of the purposes of a formal analysis and a summary pattern is to avoid having to reinvent the wheel so to speak for each new argument. Once one sees the pattern repeated, then, regardless of particular content, a ready made recipe exists with which to argue that the evidence for the above conclusion is weak or non-existent.

Students are also encouraged to look for patterns in recognizing inductive reasoning. They are taught that the following inference situations indicate inductive arguments.

<table>
<thead>
<tr>
<th>Premise</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>One, some, many, most</td>
<td>All</td>
</tr>
<tr>
<td>Past</td>
<td>Present</td>
</tr>
<tr>
<td>Present</td>
<td>Future</td>
</tr>
<tr>
<td>A happened, B happened</td>
<td>A caused B</td>
</tr>
</tbody>
</table>

These pattern recognition activities are viewed by the instructors of Philosophy 110 at HCC as crucial critical thinking tools, but also as introductory for the symbolic logic part of the course.

Students are taught the basics of propositional and quantification logic: translations, truth tables, and formal proofs. They are taught that isolating a symbolic syntax is a crucial first stage for examining the formal aspects of an argument, for the construction of a truth table, and finally for a formal proof. With truth tables, the concept of a variable is introduced to students. Prior to being introduced to the formal rules for proof construction, students are shown the power of argument recognition with variables. For instance, they are shown that all the following arguments have the same form.

Eg. 1-6

1. P ⊃ C
2. P / ∴ C

1. (M • C) ⊃ ~B
2. M • C / ∴ ~B

1. {[(A ⊃ B) ≡ (C v ~B)] • ~D} ⊃ (~E v ~F)
2. {[(A ⊃ B) ≡ (C v ~B)] • ~D} / ∴ (~E v ~F)
1. $p \supset q$
2. $p \therefore q$

Students are then introduced to Boolean Algebra rules and Copi’s propositional logic system (19 rules), followed by an introduction to quantification logic. By the final exam students must demonstrate an ability to construct attempts at formal proofs.\(^2\) They must be able to apply the rules correctly and show minimum proficiency in deriving valid steps of reasoning in both propositional and quantification logic. Students are taught that precision and accuracy are very important.

Students must also learn the difference between elegant and non-elegant proofs.

Finally, the limitations of Western logic based on Aristotelian assumptions are discussed and students are taught the basic rules of multivalued logic (fuzzy logic). Students learn to calculate degrees of truth with the extended interpretation of logical connectives given various numerical inputs.

**Negation ($\sim$):** The degree of truth of not $A = 1.0 \text{– (minus) the degree of truth of } A$.

**Example:**
- "A is short" = .40 (so)
- "A is not short" = .60

**Conjunction ($\land$):** The degree of truth of $A \land B = \text{the minimum degree of truth of } A$ and $B$.

**Example:**
- $(.40) \land (.99) = .40$

**Disjunction ($\lor$):** The degree of truth of $A \lor B = \text{the maximum degree of truth of } A$ and $B$.

**Example:**
- $(.40) \lor (.90) = .90$

**Conditional ($\rightarrow$):** The degree of truth of $A \rightarrow B = 1-(A-B)$ if $A$ is greater than $B$, otherwise 1.

**Examples:**
- $.5 \rightarrow .4 = 1-(.5-.4) = .9$
- $.99 \rightarrow .03 = 1-(.99-.03) = .04$
- $1.0 \rightarrow 0.0 = 1-(1-0) = 0$
- $0.0 \rightarrow 1.0 = 1$

\(^2\) They do not have to solve proofs. But they must show minimal proficiency in rule application accuracy. Precision is underscored as a mandatory UH hallmark.
.5 → .6 = 1

**Biconditional (↔):** The degree of truth of A ↔ B = (A→B)•(B→A).

**Examples:**

\[ .5 ↔ .4 = (.5→.4) • (.4→.5) \]
\[ = [1-(.5-.4)] • 1 \]
\[ = .9 • 1 = .9 \]

\[ .5 ↔ .6 = (.5→.6) • (.6→.5) \]
\[ = 1 • [1-(.6-.5)] \]
\[ = 1 • .9 = .9 \]

\[ .2 ↔ .1 = (.2→.1) • (.1→.2) \]
\[ = [1-(.2-.1)] • 1 \]
\[ = .9 • 1 = .9 \]

\[ .9 ↔ .1 = (.9→.1) • (.1→.9) \]
\[ = [1-(.9-.1)] • 1 \]
\[ = .2 • 1 = .2 \]

Throughout the exposition of the various symbolic techniques and exercises in formal pattern recognition, students are shown the underlying reasons for the derivations of these techniques. Formal reasoning and symbolic pattern recognition play an essential role in the course.

**Hallmark 2: Help students understand the concept of proof as a chain of inferences.**

Inductive reasoning is discussed briefly but students are provided with a theory of sufficient evidence and are given application examples of scientific reasoning. Students are taught the concepts of induction by enumeration, higher order inductions, representative sampling, randomized controlled studies, and study replication. Also discussed are the relative weights of these activities in terms of strengthening inductive arguments.

Although inductive reasoning is covered, the concept of deductive proof is the paramount concept of the course. Students must demonstrate their understanding of a deductive proof by

- recognizing valid and invalid deductive arguments,
• recognizing the forms of these arguments,
• explaining why an argument is valid or invalid in writing,
• justifying the steps in a symbolic proof,
• and by attempting to construct symbolic proofs of validity in both propositional and quantification logic.

Examples of proofs:

Propositional Logic

1. H ⊃ (~R ⊃ C)
2. ~H ⊃ (R ⊃ L)
3. L ⊃ (S • E)
4. ~C • ~H /∴ (H ⊃ R) • (R ⊃ S)
5. ~H • ~C (4) Com
7. R ⊃ L (2)(6) MP
8. R ⊃ (S • E) (7)(3) HS
9. ~~R ⊃ (S • E) (8) DN
10. ~R v (S • E) (9) Impl.
11. (~R v S) • (~R v E) (10) Dist.
14. R ⊃ S (13) DN
15. (H • ~R) ⊃ C (1) Exp.
17. ~(H • ~R) (15)(16) MT
18. ~H v ~~R (17) DeM.
20. H ⊃ ~~R (19) DN
21. H ⊃ R (20) DN
22. (H ⊃ R) • (R ⊃ S) (21)(14) Conj

Quantification Logic

1. (x){Sx ⊃ [Ex ≡ (~Fx • Bx)]}
2. (Sk • Bk) • ~Ek /∴ Fk
3. Sk ⊃ [Ek ≡ (~Fk • Bk)] (1) UI
4. Sk • Bk (2) Simp.
5. Sk (4) Simp.
6. Ek ≡ (~Fk • Bk) (3)(5) MP
The difference between classical validity and multivalued logical validity is also covered.

In the symbolic logic portion of the course, students must demonstrate proficiency in justifying the steps in a proof and also actually show minimum proficiency in creating proofs in both propositional and quantification symbolic logic.

In the multivalued logic section of the course students are not required to do proofs, but they are required to calculate degrees of truth for statements and to understand how classical Aristotelian assumptions about truth lead to paradoxical “proofs.” Students are shown how various Sorites paradoxes can be shown to be classically valid.

Eg.

If a person who is only 5 feet tall is short, then given a sequence of 999 additional persons such that starting with our 5 foot tall person, one by one is 1/32 of an inch taller than the previous person, the last person in the sequence, a little over 7 feet 6 inches tall, is also short.

Then students must understand (explaining in writing on the final exam) how non-classical assumptions about truth (multivalued logic) erase the paradox. An extended notion of deductive validity based on assuming degrees of truth is provided: A fuzzy valid deductive argument is one that does not allow for a loss of truth in going from the premises to the conclusion. The above argument is shown not to be all or nothing – valid or invalid, but rather one that loses validity as the height increases.

**Hallmark 3: Teach students how to apply formal rules or algorithms**
The best fit for the hallmark of learning a mechanical and algorithmic process of rule application in Philosophy 110 is truth tables. Both classical and mutivalued truth tables are covered.

Eg. 3-1 (Classical truth functions)

<table>
<thead>
<tr>
<th>p</th>
<th>q</th>
<th>~p</th>
<th>~q</th>
<th>p•q</th>
<th>pvq</th>
<th>p⊃q</th>
<th>p≡q</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
<td>F</td>
<td>F</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>T</td>
<td>F</td>
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<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
</tbody>
</table>

Eg. 3-2 (Example of a fuzzy logic truth table)

If p = X is not short.
q = X is short and X is young.
r = X is short or X is young.

then we can compute the following values:

<table>
<thead>
<tr>
<th>Height</th>
<th>Age</th>
<th>X is short</th>
<th>X is young</th>
<th>p</th>
<th>q</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>5' 0&quot;</td>
<td>10</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>5' 1/32&quot;</td>
<td>12</td>
<td>0.99</td>
<td>0.96</td>
<td>.01</td>
<td>.96</td>
<td>.99</td>
</tr>
<tr>
<td>5' 6&quot;</td>
<td>65</td>
<td>0.80</td>
<td>0.00</td>
<td>.20</td>
<td>0.0</td>
<td>.80</td>
</tr>
<tr>
<td>6' 0&quot;</td>
<td>55</td>
<td>0.60</td>
<td>0.18</td>
<td>.40</td>
<td>.18</td>
<td>.60</td>
</tr>
<tr>
<td>6' 6&quot;</td>
<td>18</td>
<td>0.40</td>
<td>0.85</td>
<td>.60</td>
<td>.40</td>
<td>.85</td>
</tr>
<tr>
<td>7' 0&quot;</td>
<td>25</td>
<td>0.20</td>
<td>0.73</td>
<td>.80</td>
<td>.20</td>
<td>.73</td>
</tr>
<tr>
<td>7' 5&quot;</td>
<td>45</td>
<td>0.03</td>
<td>0.36</td>
<td>.97</td>
<td>.03</td>
<td>.36</td>
</tr>
<tr>
<td>7' 6&quot;</td>
<td>29</td>
<td>0.00</td>
<td>0.65</td>
<td>1.0</td>
<td>0.0</td>
<td>.65</td>
</tr>
</tbody>
</table>

For the latter example, the computations are done using the basic rules of multivalued logic noted above in Hallmark 1. Although there is no one assignment of degrees that can be said to be absolutely correct, fuzzy logicians talk about a "reasonable assignment of degrees" given two extremes. A typical method is to assign 0 to the lowest value and 1 to the highest value, then any intermediate value will equal the original quantitative assignment (in the case of height above) minus the lowest value divided by the difference between the lowest and highest values. The above intermediate degrees were achieved in the following way. Given that 5' equals 1 and 7' 6" equals 0 for the statement "X is short," then any intermediate height x equals 1 - [(x-5)/2.5].
Students must demonstrate that they can apply the formal truth functional rules for classical logical connectives to determine the truth function for statements and then, when statements are combined in arguments, whether arguments are valid or invalid.

Eg. 3-3 (Example of a statement from an exercise)

\[\{[X \supset (Y \supset \neg Z)] \supset [\neg (X \cdot Y) \supset Z]\} \equiv \neg [\neg (X \supset A) \supset (B \supset Y)]\]

Eg. 3-4 (Example of an argument)

1. X \supset (\neg Y \supset Z)
2. Y v X
3. \neg Y   \therefore  Z \cdot \neg Y

For the multivalued logic section, students are not required to examine arguments, but they are asked to calculate precise values of truth for statements.

Students are given exercises, such that using the multivalued logic interpretations of the logical connectives, they need to calculate out the degree of truth, assuming that A = .7, B = .3, and C = .1.

Eg. 3-5

\[[(A \rightarrow B) \cdot (B \rightarrow C)] \rightarrow (\neg C \rightarrow \neg A)\]
\[[(.7 \rightarrow .3) \cdot (.3 \rightarrow .1)] \rightarrow (.1 \rightarrow -.7)\]
\[[(.7 \rightarrow .3) \cdot (.3 \rightarrow .1)] \rightarrow (.9 \rightarrow .3)\]
\[[(1-(.7-.3)) \cdot (1-(.3-.1))] \rightarrow [1-(.9-.3)]\]

\[
\begin{array}{c}
.6 \\
.8
\end{array}
\rightarrow .4
\]
\[
.6 \rightarrow .4
\]
\[
1 - (.6-.4)
\]
\[
.8
\]

Precision and attention to detail are emphasized as crucial. Students are told that logicians and mathematicians are anal retentive and proud of it.

However, the rules for the logical connectives for both classical and multivalued logic are not just presented as absolutes to be learned without any background rationale. One of the main reasons for covering multivalued logic and contrasting it with classical logic is to show that logical assumptions need reasons as well and that in this case the reasons have a cultural and philosophical foundation.
Different philosophical conceptions of truth are discussed and rule generation is based on the elements of this discussion. Classical logic is shown to be based on Western (Greek-Aristotelian) philosophy and Multivalued logic is shown to be based on Eastern (Buddhist) philosophy.

In propositional and quantification logic and the construction of formal proofs, students are also taught that any flaw in the application of a rule is very serious. As noted above, students are told that they cannot fulfill the UH hallmarks and pass the class if they cannot apply the rules correctly. Correct application of a rule is absolute. Students learn that applying a logical rule cannot just be “close” or a “nice try.” Students learn that creativity can apply to proofs in terms of elegance and surprising conclusions, but the rules to produce creativity must be accurately applied.

It is important to note that the application of a rule, such as the rule of Distribution in Boolean algebra and propositional logic, is algorithmic, the foundation for understanding the rule is not. Essential is to understand the important role of variables in mathematics and logic.

**Hallmark 4: Require Students to Use Appropriate Symbolic Techniques**

Throughout the course students are shown how the behind the scenes patterns provide a basis for recognizing arguments (formal and informal, deductive and inductive), the parts and structure of arguments, and for distinguishing between valid or strong and invalid or weak arguments. Students are shown how the recognition of patterns and the symbolic presentation of patterns provide a highly focused and rigorous method for argument analysis.

On quizzes and the final exam, students must show that they can translate arguments presented in English into a symbolic language (propositions and quantification) for analysis.

The limitations of particular symbolic systems are also taught and students are introduced to the notion that symbolic methods developed for a particular domain of discourse will not apply in others. One of the purposes of covering multivalued logic is to show the limitations of propositional and quantification logic in examining arguments such as:

Visibility is slightly low today.
If visibility is low, then flying conditions are poor. Therefore, flying conditions are slightly poor today.

Venn diagrams are also shown to be limited in dealing with fuzzy sets.

**Hallmark 5: Include computational and/or quantitative skills.**

The Phil 110 course at HCC includes both computational and quantitative skills. As noted above, Philosophy 110 was a core course option in the old quantification skills category in the UH system for about 40 years until the core was changed in 2000. An examination of some of the central content of Philosophy 110 shows why this designation was appropriate. In addition to quantification logic (predicate calculus) Boolean algebra, as it was later developed in propositional logic by logicians and mathematicians, is covered in depth. In general, many of the techniques of mathematical logic play a major role in the course. Students will recognize the connection with math courses. For instance,

"The rules have jogged many old memories of algebra rules and geometry proofs from math classes. I honestly didn't expect to learn these things in this course, and, ironically, I took this course because I was too lazy to relearn all the math rules and formulas. I won't say yet that I'll start taking math again, but I'm starting to remember how fun it was."  Travis Marino, UH West Oahu DE student.

"The translation chapter was really interesting to me, because it seemed like a blend of both Algebra and English. At first I was not looking forward to this section -- the translations seemed a lot like mathematical proofs, (which I hated in high school) but looking a little deeper they almost reminded me more like the rules of grammar and sentence structure, or even more like maps, helping to convey the sum and all its parts in a single image. It was actually really cool to see how logic embodies all of those disciplines, and kind of magical how simple it is to translate more complex arguments into symbolical equations after practicing. . . . For me, using the symbolic rules in the other chapters is very psychological. When I think about it like math I get frustrated, but when I think about it like seeing patterns, or learning how to read a language, it's interesting to me. It is enlightening to see the connection between what I thought were only algebra rules (Association, Commutation, Distribution, Transposition,

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3 Comments from Laulima discussion posts and assessment surveys, S14.
etc.) and thinking in real language.” Rachel Goldberg, UH Manoa DE student.

“I found the rules of inference and replacement easy to understand (except for the Latin terminology) and apply. The process is very similar to mathematical problem solving. In math, you can often substitute a single variable for a more complex group of numbers then solve the problem, then re-substitute the complex numbers back into the simplified formula. This seems to apply here (when you see the commonalities) but I'm being careful since it's new material. You mentioned earlier in the class how important math skills are and it definitely is true.” Steve Barlow, LCC, DE student.

We receive comments such as these every semester, mostly from students who were hoping that logic would not be like math.

The concept of a variable, and the application in calculating and reasoning symbolically with variables, plays a major role in mathematics, propositional logic, and quantification logic.

In addition to the important role of variables and reasoning and calculating with the use of variables, in the Phil 110 course at HCC, numerous elements of basic numeracy, computation, and quantification are covered – but all with a focus on correct inference and good reasoning.

As part of the introduction to the course, students learn to see that they can be exploited by making an illogical inference from advertising gimmicks that take advantage of numerical illiteracy, such as,

"Name-brand discount clothing can be yours as you save up to 75% off regular retail prices at 6pm.com! Since you can't run around naked, adorn your fine figure with shirts, shorts, pants, dresses, jeans, jackets, and hoodies. If you're shopping for a friend, family member or significant other, you're in luck! 6pm.com carries value-priced clothing for women, men, and kids."

Because zero (0) is a number and everything in this store is between 0% and 75% off, only one item at this store needs to be 75% off legally, mathematically, and logically. Some students will be surprised that getting a good deal on a hoodie is not guaranteed, let alone there being no guarantee that a hoody will be 75% off.
“Only Bank of Hawaii offers 11.5% as an introductory rate for its Platinum credit card.”

In order not to be tricked by such advertisements, students need to understand some basics of quantification logic (Only ≠ All) and combine with basic numeracy to understand that this statement could be true, but another bank still offer a lower rate.

"Of all the things we make, we make sense! There are some things we skimp on: Calories. Fat. Sodium. With less than 300 calories, controlled fat and always less than 1 gram of sodium per entree, we make good sense taste great."

Here students must realize some basic facts about the metric system, that 1 gram is equal to a 1,000 milligrams, and that in terms of salt intake this is very high as measured by the FDA.

Students are also shown that political and world leaders play fast and loose with numbers.

“It is not true that our country is not committed to education and the financial support for education. Last year we increased our financial support for public education in our country by 50%. 50%! Higher than any other nation in the world.” Myanmar political leader.

The country increased its education budget from 1% of government expenditures to 1½%. Its military budget was 23% of the government budget.

Students are also shown how mathematics is used deductively to make inferences and predictions in science. For instance, students are introduced to Eratosthenes’ use of the deductive consequences of the Euclidean parallel postulate -- when a transversal cuts two parallel lines, the corresponding angles and alternate angles are equal – to infer that the probable circumference of the Earth was approximately 25,000 miles.

Students are shown that Eratosthenes needed information – that at 12 noon on the day of the summer solstice in ancient Egypt he measured a 7 degree angle of a shadow in his city of Alexandria (sun was seven degrees south of zenith) but there was no shadow in ancient Syene (sun at zenith), and that the distance between Syene and Alexandria was approximately 500 miles (or 805 kilometers in modern
measurements). Students must also realize that Eratosthenes had to make some inductive generalizations (well supported for even his time) – that the sun was very large compared to the Earth and that it must then be very far away, so far that the light rays would be virtually parallel by the time they reach the Earth. This allowed the deduction that the Earth’s surface was curved to account for the different shadow measurements. And if curved, it was reasonable to generalize that the Earth was a sphere, also confirmed by observations of the eclipse of the moon by the Earth.

Students are shown how the above reasonable assumptions combined with crucial numerical measurements, knowledge of degrees and degrees of a circle, use of fractions, and the geometric implications of the Euclidean parallel postulate, provide a calculation of about 40,234 kilometers (about 25,000 miles). Important is that students are shown that although this result is amazing for the 3rd century BC, the result is in error of about 200 kilometers or about 125 miles. Students are then asked to calculate what the results would be given different scenarios for the distance between the cities and the degree of shadow measurement.

Important in this exercise is to show the crucial interplay between inductive and deductive logic. That the premises (numerical inputs and generalizations) used for the mathematical deduction/calculation can be changed, resulting in different answers. In this sense, truth in science is always tentative, probable, and hypothetical, even though the tools of logic and mathematics are essential in the ongoing testing process.

In terms of the use of symbolic and mathematical techniques applied to practice, the point is made that Eratosthenes’ achievement is ancient but that modern science uses the same basic procedures. If Eratosthenes could calculate a probable result for the Earth’s circumference that would shock the average person at his time, what can modern science show us today? The age and size of the universe is then discussed as portrayed by modern science, along with the use of parallax to measure distances to stars, and exponential notation and algebraic rules (Bx x By = B(x+y) to calculate the approximate number of atoms in the universe.

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4 He had to have the distance between the cities measured. He used stadia.
5 Due to the cities not being on the same meridian of longitude.
The use of exponents and algebra are also applied to creation of classical and fuzzy logical truth tables. Students must use $2^y = n$ to calculate the number or rows needed to exhaust the possibilities of truth value assignment for a classical truth table. In the creation of fuzzy logic truth tables, they are shown how to use $1 - [(x-5)/2.5]$ to assign degrees of truth. (see above).

Philosophy 110 was placed in the old quantitative reasoning category also due to its coverage of quantification logic (QL). Traditionally, first-order predicate calculus rules are covered in Phil 110 and higher-order predicate calculus, along with relations, are covered in Phil 445. Phil 110 at HCC follows the textbook used and covers the basic rules of QL, quantification-negation laws (Change of Quantifier Rules), the square of opposition, and a very brief introduction to relations. Students are shown but are not required to reproduce complex quantification statements using relations. For instance, Lincoln’s famous statement:

\[
\{ (\exists x)[P(x)(Ty \supset Fxy)] \bullet (\exists y)[Ty \bullet (P(x) \supset Fxy)] \bullet (\exists y)(\exists x)[(Ty \bullet Px) \bullet \neg Fxy]\}
\]

"You can fool some of the people all of the time, and all of the people some of the time, but you cannot fool all of the people all of the time."

This logic course is challenging for students primarily because "rote" computational activity is treated as only a means to an end of reasoning evaluation. Students find truth tables to be the easiest symbolic process primarily because it is purely computational and involves little creativity.\(^6\) Computing degrees of truth with the rules for logical connectives in multivalued logic is also purely mechanical. (See examples above in the Hallmark 3 section.)

Although computational skills are not the focus of the course, students are taught the important connection between sequential logical reasoning and proficiency in mathematics. Whenever possible, students are shown the logical foundation for many algebraic concepts. For instance, the connection between the concept of a variable in propositional logic ($p$, $q$, $r$) and algebra ($x$, $y$, $z$) is discussed and various rules compared. For instance, commutation in logic -- $(p \bullet q) \equiv (q \bullet p)$ -- and commutation in mathematics -- $(x + y) = (y + x)$, and the other standard Boolean rules. The beauty and power of simple mathematical formulas are also discussed. For instance, $2^x = y$ as

\(^6\) Provided students can do the creative and abstract part of assigning variables and recognizing the number of variables in an argument.
applied to truth table construction of logical possibilities of truth values. Students are shown that it would take forever, and most likely produce errors, when \( x \) is large, to figure out all the logical possibilities. Students are taught that algebra was not invented to torture them, but to save vast amounts of time, that it is simply shorthand arithmetic mixed with logical rules.

However, throughout the course students are challenged with reasoning tasks where there is not one rote answer. Many potential formal correct proofs exist for a particular argument. Different interpretations of an argument exist. Different correct symbolic translations of an argument exist. Different interpretations of an informal fallacy exist and different recipes can be attempted for an analysis.

As noted above, most important is that students are challenged to use symbolic trails of reasoning. They don't just watch proofs being constructed or justify steps after they have been constructed. They must construct their own proofs and experience the agony and ecstasy of proof construction. Frankly, students are somewhat shocked that there is no mechanical or formulaic way of doing proofs. Here is an example of a student “protest” from the online version of the course.

“I keep hoping that there has to be some clear recipe just like what we learned in Informal Fallacies. I guess I'm thinking that it is all ‘relative’ . . . It feels so unstructured and I feel like there is no way to really 'check your work’. . . .and know how we know if we are on the right track. I would love something structured. Is there any trick to seeing which lines go with which rules? How do I know after an hours work on just one problem if I am on the right track? I can apply the rules and create a godzillion lines, but why can’t I get the conclusion quickly?”

In this context, students are told “life is tough.” For every decision they make in life, they cannot predict deductively if this decision will insure a successful outcome. As in life, there is often no clear, “structured” way through a proof. And as in life, there is often no way to “check” your decisions as you make them until much later and after a lot of pain. They are asked to reflect on all the decisions they have made in their lives. Have they been perfect? Elegant? Or, did they “blunder forward” a lot? How do we know to do the right thing at the right time? Are decisions all relative? Our answer, as with formal proofs, is there are many paths through life that are good and many that are bad. So, the relativists are wrong. In the case of formal
proofs, some proofs are right (even though they are different) and some are definitely wrong – they have Xs. And some are amazingly elegant.

However, they are also told that preparation and a firm foundation in understanding the rules are essential for success.

Within this context students are also told the story of Andrew Wiles and Fermat’s Last Theorem ($x^n + y^n = z^n$ – no solutions when $n > 2$). How some of the greatest mathematicians could not solve the problem and how generations of mathematicians worked on the problem for over 350 years, and how Wiles spent most of his academic career on the problem and eventually solved it.

**Hallmark 6: Build a Bridge from Theory to Practice**

The approach at Honolulu Community College is to construct a seamless connection between informal reasoning/critical thinking and formal/symbolic analysis. We believe it is a pedagogical mistake to assume or create a wall between critical thinking and formal analysis and the learning of symbolic and computational techniques. We start with informal contexts that students are most likely to encounter in their everyday lives, involving basic reasoning and numerical inferences. We show them the patterns of reasoning that lie hidden behind the surface. We show them how these patterns can be symbolized for easy identification and manipulation. We gradually turn up the heat so to speak by forcing them to understand formal recipes for fallacy analysis, then turn to full-on symbolic translation and analysis of deductive arguments using the rules of propositional, mathematical, and quantification logic. We then show them how all the formal techniques can be applied back to informal contexts.

Relevance is a major concern of every instructor at Honolulu Community College. As the student cited above noted, “It is enlightening to see the connection between what I thought were only algebra rules (Association, Commutation, Distribution, Transposition, etc.) and thinking in real language.”

Political speeches, advertisements, op-ed pieces, and so on are constantly scrutinized for examples for class lectures, handouts, quizzes, and exams. Students are encouraged to read more news sources and be more aware of local, national, and international issues. Quiz examples and symbolic translation examples are often taken
directly from the opinion-editorial pages of local, national, and international newspapers.

Students are shown how the basic details of argumentation learned in this course apply to the big picture. Given any act of persuasion related to important problem solving, a rational human being approaches it in the following way:

1. What is the structure of the argument? What is the conclusion? What is the evidence or premises?

2. Given that we now know the argument’s structure, if the premises are true, do they provide good reasons (valid for deductive, strong or highly probable for inductive) for the conclusion?

3. Are the premises true? What information/evidence do we have that would confirm the premises as true? What is the quality of that evidence from the standpoint of a strong inductive argument?

Students are told that we concentrate mostly on 1 and 2 in this course. For number 3, although inductive reasoning is covered, students are told that they need to be informed about local, national, and international issues. Reasoning is very important, but truth also matters.

We believe that our students are provided with the opportunity of learning a mental discipline of problem solving that will stay with them the rest of their lives. Many examples could be given of how a bridge is constructed from theory to practice -- from the harmful consequences of confusing the difference between inclusive and exclusive disjunctions, to the cultural/philosophical influence of deciding the foundation for truth table analysis (Western assumptions v. Eastern assumptions about truth) -- but it is perhaps best to address this question with a former student comment.

"This course kicked my butt. It surprised me though that I learned a kind of thinking surgery in this course that I know I will use in my other classes and stay with me the rest of my life. I think I leaned [learned] how to do real analysis. Before when I read something, it now seems like there was a fog between my eyes and mind and what I was reading. I realize I was just reacting to bits and pieces of what was being said. I wasn't really concentrating. I was making decisions based on very superficial stuff. Now I know how to focus, how to stay calm (I can still hear your voice, "First step, stay calm")!, and separate
the pieces. What is the argument? What is the conclusion? What are the premises? What kind of argument is it -- deductive or inductive? Is it a simple informal fallacy? If so, what really should be discussed? If deductive, is it valid or invalid? Does it commit one of the formal fallacies? (I am amazed how many times now I can see someone committing the fallacy of affirming the consequent or denying the antecedent!) Are there any words that need to be defined? Are the words being used fairly ("terrorism with a global reach," "coalition of the willing," "collateral damage,")? If inductive, is the evidence strong or weak; even if strong, what kind of evidence would make the conclusion even stronger? I even find myself using the symbolic logic! Just the other day I read an unnecessarily complicated sentence in the form \( \sim(p \cdot \sim q) \) and remembered right away the derivation in class and the more straightforward statement \( p \Rightarrow q \).

One downside. I still sometimes have dreams with p's and q's in them. And, my wife says that I am starting to sound like the guy in the Mercedes Benz's commercial. Well I guess I will just have to tell her that this was the Mercedes Benz of courses.

Thanks.

PS One of the reasons I still find myself dreaming of p's and q's is that I still work occasionally on the super challenging problem. I can't believe that more women have solved this problem than men. I plan to get this \%@*$&! problem before I die. I'll send it to you by e-mail, so don't die before I do!"

Note: The student was eventually successful in solving the 50 step proof. He sent me his proof form Germany.

6. **Assessment** and Changes since last Certification – fall 09

We have been involved in assessment since the beginning of the various assessment initiatives on campus. In addition to meetings and discussion on exam (instructors use the same exam format) and grading rubrics, we have been using a pre and post hallmark (SLO) survey for several years and we have been pleasantly surprised on how many students note that they are "moderately more confident" or "very confident" on accomplishing the hallmark objectives.

Pre and Post SLO surveys have consistently shown that students will average 30-60% confidence on the SLO/Hallmarks at the beginning of the semester and 60-80% confidence (moderate and high) at the end
of the semester. Consistently the data show that students have the most difficulty with hallmark #4 and part of hallmark #2 (recognizing inductive reasoning).

Although the inductive reasoning concern is most likely due to the fact that the course is primarily on deductive reasoning, and only a small amount of time is spent on covering inductive reasoning, interactive Softhchalk tutorials have been created to add student understanding on this topic.

We are a small department. Most of the time two instructors teach 110. Due to course cancellation issues, a third instructor taught a section of Phil 110 in the spring 2014. We consistently collaborate on pedagogy, exams, and curriculum. To help the new instructor, collaboration on pedagogy, quizzes and exams, including rubrics for grading, were increased.

We use the same syllabus and use the same hallmark (SLO) surveys each semester.

In spring 2014, a complete hallmark survey was conducted comparing two on-campus courses with the DE courses. These results will be part of the yearly assessment inventory submitted to the Division I Division Chair and the DE coordinator.

We organize student tutors every semester.

We have continued to strengthen the approach to hallmark #6 – Build a Bridge from theory to practice. Previously the two main instructors were trained in SmartBoard technology and developed new curriculum and student exercises to strengthen our approach to all the hallmarks. Our main goal with the use of the SmartBoard technology was to create more interactive exercises for students. We already use groups and collaborative learning techniques and further used the SmartBoard for students to put up their group work. Particularly relevant is to have students do formal proof work on the SmartBoard, critique and discuss the proofs, and be able to save them to web pages.

Unfortunately the Smartboards were not supported by ITS when classes were moved to temporary locations spring 2014. It also appeared that they would no longer be supported in our classrooms due to electrical surge problems when the renovation of building 7 is complete. To adjust, the senior instructor has been developing interactive tutorials using Softchalk software. By fall 2014, most of
This class fulfills a Foundation Requirement in Symbolic Reasoning and articulates with UH Manoa's Philosophy 110 course.

Instructor: Ronald C. Pine, PhD  
Office: Bldg 7, Rm 625  
Phone: 845-9163 (& voice mail)  
Email: pine@hawaii.edu  
Home Page: Ron's Web Page

Class Hrs:
- 1 hour in class = 2 hours outside class

Recommended Prerequisite:
- Should be able to read and write at the College level.  
- Since the ability to comprehend what you read is a prerequisite skill in logical reasoning, students are advised to take the necessary English courses either prior to or concurrently with Phil. 110.

Texts:
- Essential Logic: Basic Reasoning Skills For the Twenty-First Century, by Ronald C. Pine  
- Lecture and Tutorial Supplements  
- Course Video Links

Course Description:
- The course develops basic techniques of analysis and an understanding of the principles and concepts involved in clear thinking. Emphasized will be logical validity, deductive and inductive reasoning, fallacious arguments, symbolic logic, and scientific method as applied to criteria of reasonable evidence.

This course fulfills the Symbolic Reasoning requirement for the Foundation requirement for Honolulu Community College and the University of Hawaii at Manoa. See the Manoa General Education requirements.

Course Purpose:
- Because we live in a highly technological society, students should gain a basic understanding and appreciation of formal reasoning and its connection with the informal reasoning of everyday life. Students should also gain an understanding of the basic software foundations for our machines (computers, game consoles, cell phones, etc.), and the process of putting human thoughts into these machines. Additionally, the course is based on the assumption that the less we think critically the more someone else will think for us — usually with the intention of manipulating us. From this point of view, logic can be viewed as a defensive tool enabling each of us to defend ourselves against the onslaught of persuasive appeals that bombard our minds daily. As such it is an important element in the development of individual potential — enabling us to be freer and more decisive individuals.
Course Objectives and Outcomes: Students will:

- demonstrate an understanding of the beauty and power of symbolic systems, as well as their clarity and precision, through use of techniques of logical and quantitative analysis, with the intention of enhancing the student's reasoning skills and appreciation of abstraction, pattern recognition, and formal systems of analysis.

- demonstrate an understanding the concept of logical proof as a chain of inferences by producing symbolic chains of inferences of their own.

- demonstrate skill in hypothetical reasoning, and gain experience in the presentation and critical evaluation of evidence.

- demonstrate an ability to use symbolic techniques and formal rules in the context of problem solving by applying symbolic analysis techniques (translating, formal proof techniques, truth tables, argument pattern recognition) both to informal (fallacies) and formal reasoning.

Course Content:

A. Introductory lectures covering basic terminology. (10%; Chapters 1-3)

1. Reading carefully -- recognizing arguments and persuasive appeals.
2. Argument analysis -- premises and conclusions.
3. Deductive and Inductive reasoning.

B. Common logical (informal) fallacies. (15%, Chapters 4-5).

Although this part of the course is on informal fallacies, it will emphasize the formal (symbolic) patterns of fallacies.

1. Fallacies of Relevance
2. Fallacies of Questionable Premise
3. Fallacies of Weak Induction

C. Basic skills of symbolic logic. (70%, Chapters 7-12)

Content:

1. Symbolic Translation
2. Truth Tables
3. Formal Proofs of Validity (Copi's Nineteen Rules of Inference)
4. Quantification Logic
5. Multivalued (Fuzzy) Logic

Evaluation:

- Since this course involves a step by step introduction of material, class attendance is very important.

- There will be ten quizzes (20pts. each = 200 pts.), one exam on Chapters 1-5 (100 pts.), and a final exam covering Chapters 7-12 (160 pts.).

- There will be no make-ups of individual quizzes, but for the non-flipped classroom courses there will be an extra-credit-day (50 pts.) prior to the final.

- For the flipped classroom courses, class attendance and Laulima postings (50pts.) will replace the EC day.

- Points gained on the extra-credit-day or the Laulima postings in the flipped classroom courses can be used to make up
the points of missed quizzes, provided that a student has a good reason for missing a quiz and has communicated that reason to the instructor.

- These options will be explained further in class. The final grade will be based on a percentage of the total points as follows:
  - 100-90% = A
  - 89-80% = B
  - 79-66% = C
  - 65-55% = D
  - 54% = F, N or Inc.

- Please note that the "N" and "Inc." grades are given only for special circumstances.

- Special Note: Students with disabilities may obtain information on available services online at http://honolulu.hawaii.edu /disability. Specific inquiries may be made by contacting Student ACCESS at (808) 844-2392 voice/text, by e-mail at access@hcc.hawaii.edu, or simply stopping by Student ACCESS located in Bldg. 7, Rm. 319.

Advise: How to be Successful in this Class
Application Questions for Foundation Hallmarks (Hallmarks in bold)
Explanatory Notes for each hallmark are at http://honolulu.hawaii.edu/intranet/articulation/foundations/hallmarks.html.

SYMBOLIC REASONING (FS): To satisfy the FS requirement, a course will

1. expose students to the beauty, power, clarity and precision of formal systems. How will the course meet this hallmark? How will you assess this and provide evidence that students are meeting this hallmark? See attached.

2. help students understand the concept of proof as a chain of inferences. How will instructors help students understand this concept? How will you assess this and provide evidence that students are meeting this hallmark? See attached.

3. teach students how to apply formal rules or algorithms. How will instructors meet this hallmark? How will you assess this and provide evidence that students are meeting this hallmark? See attached.

4. require students 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 the course? How will you assess this and provide evidence that students are meeting this hallmark? See attached.

5. include computational and/or quantitative skills. What reasoning skills will be taught in the course? What computational and/or quantitative skills will be taught in the course? How will you assess this and provide evidence that students are meeting this hallmark? See attached.

6. 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? How will you assess this and provide evidence that students are meeting this hallmark? See attached.
these interactive tutorials were complete and the senior instructor is experimenting with the “flipped classroom” pedagogy. The textbook, lectures, and interactive tutorials will all be online at Laulima. Class time will be spent on doing exercises and problem solving in groups with guidance from the instructor.
This class fulfills a Foundation Requirement in Symbolic Reasoning and articulates with UH Manoa's Philosophy 110 course.

Instructor: Ronald C. Pine, PhD
office: Bldg 7, Rm 625
phone: 845-9163 (& voice mail)
email: pine@hawaii.edu
Home Page: Ron's Web Page

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- Since this course involves a step by step introduction of material, class attendance is very important.

- There will be ten quizzes (20pts. each = 200 pts.), one exam on Chapters 1-5 (100 pts.), and a final exam covering Chapters 7-12 (160 pts.).

- There will be no make-ups of individual quizzes, but for the non-flipped classroom courses there will be an extra-credit-day (50 pts.) prior to the final.

- For the flipped classroom courses, class attendance and Laulima postings (50pts.) will replace the EC day.

- Points gained on the extra-credit-day or the Laulima postings in the flipped classroom courses can be used to make up
the points of missed quizzes, provided that a student has a good reason for missing a quiz and has communicated that reason to the instructor.

• These options will be explained further in class. The final grade will be based on a percentage of the total points as follows:
  
  - 100-90% = A
  - 89-80% = B
  - 79-66% = C
  - 65-55% = D
  - 54% = F, N or Inc.

• Please note that the "N" and "Inc." grades are given only for special circumstances.

• Special Note: Students with disabilities may obtain information on available services online at http://honolulu.hawaii.edu/disability. Specific inquiries may be made by contacting Student ACCESS at (808) 844-2392 voice/text, by e-mail at access@hcc.hawaii.edu, or simply stopping by Student ACCESS located in Bldg. 7, Rm. 319.

Advise: How to be Successful in this Class
Application Questions for Foundation Hallmarks (Hallmarks in bold) Explanatory Notes for each hallmark are at [http://honolulu.hawaii.edu/intranet/articulation/foundations/hallmarks.html](http://honolulu.hawaii.edu/intranet/articulation/foundations/hallmarks.html)

**Symbolic Reasoning (FS):** To satisfy the FS requirement, a course will

1. **Expose students to the beauty, power, clarity and precision of formal systems.** How will the course meet this hallmark? How will you assess this and provide evidence that students are meeting this hallmark?
   
   See attached.

2. **Help students understand the concept of proof as a chain of inferences.** How will instructors help students understand this concept? How will you assess this and provide evidence that students are meeting this hallmark?
   
   See attached.

3. **Teach students how to apply formal rules or algorithms.** How will instructors meet this hallmark? How will you assess this and provide evidence that students are meeting this hallmark?
   
   See attached.

4. **Require students 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 the course? How will you assess this and provide evidence that students are meeting this hallmark?
   
   See attached.

5. **Include computational and/or quantitative skills.** What reasoning skills will be taught in the course? What computational and/or quantitative skills will be taught in the course? How will you assess this and provide evidence that students are meeting this hallmark?
   
   See attached.

6. **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? How will you assess this and provide evidence that students are meeting this hallmark?
   
   See attached.