General Education

Foundations Course Designation Proposal
for Fall 2004-Summer 2009

Written Communication   Symbolic Reasoning   Global & Multicultural Perspectives

The Foundations Board invites your department to propose an undergraduate course for a Foundations designation. The Foundations Board will review all proposals to ensure that approved courses meet Foundations Hallmarks. If the Foundations Board and the General Education Committee approve the designation, all sections of the course will receive the Foundations designation for five years.

Background: Since Fall 2001, undergraduates must take approved courses in Written Communication (3 credits), Symbolic Reasoning (3 credits), and Global and Multicultural Perspectives (6 credits). For full information about General Education requirements, see the 2003-2004 Catalog, pages 70-74 (online at www.catalog.hawaii.edu), or visit www.hawaii.edu/gened.

To propose a course, submit the following to the General Education Office (Bilger 104; fax 956-9170):

a) this form, completed;
b) a copy of the course’s UHM-1 or UHM-2 form, if the course is new or being modified;
c) a description of how the course meets the Foundations Hallmarks (see page 2);
d) an explanation of how you will demonstrate in five years that this course has been meeting the Foundations Hallmarks; and
e) a master syllabus. (If multiple instructors teach the course and use varying texts and/or assignments, include three representative syllabi.)

Proposal Deadline: Monday, November 10, 2003

The Foundations Board will review the information you provide to ensure that the course meets all of the Foundations Hallmarks for the requested area. If clarification is needed, a Board member will contact you.

1. Please provide course information. Subject Math Course number 203 (e.g., “ANTH”)
   If the course is cross listed, please provide the cross-listing: Subject Course #
   Course title: Calculus for Business and Social Sciences

2. Select the Foundations area you are requesting for the above course. (Check one.)
   ___Written Communication   ___Symbolic Reasoning   ___Global & Multicultural Perspectives

3. Existing course: Is the course description in the 2003-2004 Catalog consistent with the Hallmarks of the Foundations area requested?
   ___Yes   ___No– If “No,” complete a UHM-2 form with a course description that is consistent with the Hallmarks. A copy of the UHM-2 form with the College or School Dean’s signature is required.

   New course: Submit a copy of the UHM-1 form (College or School Dean’s signature is required) if the course is new.

4. Provide the requested information for the Foundations designation you are seeking (see page 2).
5. Department Chair signature is required.

______________________________________________________ _____________________
Department chair signature       Date
__Charles Matsuda________________
Department chair’s printed name

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Foundations Hallmarks & Application Questions

SYMBOLIC REASONING (FS)

1. Students will be exposed to the beauty, power, clarity and precision of formal systems. How will the course meet this hallmark?

The beauty, power, clarity and precision of Calculus allowed Isaac Newton to develop in minutes the planetary laws. It took Kepler nearly forty years to state these laws using other methods. Leverrier used Calculus to guide the astronomer Galle’s telescope to the exact time and location of the suspected, but never seen before planet Neptune. These are only two examples of an endless list. A great percentage of the history of science is a registry of the human effort to formulate models of the real world in mathematical terms. Math 203 is an applied calculus course. The students will experience the beauty, power, clarity and precision of these formal models by solving real – life problems in Economics, Business and Social Sciences, using the theory of calculus.

2. Instructors will help students understand the concept of proof as a chain of inferences. How will instructors help students understand this concept?

The instructors teach the concepts of limits and derivatives. To verify that a number is the limit of a function at a certain x value, the instructor shows a chain of inequalities. To prove that a function is the derivative of another function the instructor will show a chain of steps starting with the average slope and ending up with the limit as delta x approaches zero. Other more advanced proofs include the proof of the mean value theorem for differential calculus, the proof of the theorem that if a function is differentiable it is also continuous, most limits and derivatives properties and the fundamental theorem of calculus, to name a few.

3. Instructors will teach students how to apply formal rules or algorithms. How will instructors meet this hallmark?

If we understand algorithm as a procedure with a finite number of steps, this calculus class contains many opportunities to meet this hallmark. Examples of algorithms covered in this class are: Newton's Method, step-by-step procedures to sketch the graph of a function, the step-by-step techniques for limits and derivatives mentioned in 2 above, and so on and so forth.

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 the course?

Symbolic interpretation and setting up of mathematical problems as calculus problems is the essence of Mathematics. The language of Mathematics requires symbols and without them it is impossible to convey to the students the math concepts and formulas. Standard symbolic techniques will be used. These include using the first letters of the alphabet for constant values and the last letters of the alphabet for variables, although, as always, flexibility is allowed to the instructor. The standard symbols of differential and integral calculus are used in this course. Presentations and evaluations of evidence will be incorporated using calculus problems involving optimization and other applications.

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

The instructor will teach the concepts of derivative and integrals, for instance, by introducing the general definition and the most important theorems. Afterwards, the instructor will differentiate and integrate particular functions. This is an example of how the student will learn deductive reasoning as the transition from the general concept to specific situations. The student also will learn heuristics in solving word problems (the steps suggested by George Polya in his book How to Solve It).

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?

By teaching the wide variety of applications involved in a Calculus course. Calculus is one of the most applications-oriented math disciplines. The instructor will lay out the theoretical foundations of calculus and will show the practical results contained in word problems.

Explanation of how you will demonstrate in five years that this course has been meeting the Foundations Hallmarks.

The KapCC math department will demonstrate that Math 203 has been meeting the Foundations Hallmarks by:

Conducting periodic evaluations of the instructional procedure to verify that the instructors of the class are adhering to the requirements.
Conducting periodic revision of the syllabus.
Performing a constant update and evaluation of textbooks and technology.
Making these hallmarks an important component of the evaluation process. The instructor will incorporate specific test questions to assess critical thinking, reasoning skills and the other aspects of the symbolic reasoning hallmark.