

VIRGINIA TECH

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TO: All Members of the Faculty

FROM: C. Wayne Patty

Several months ago at a faculty meeting I heard quite a few comments that we were trying to cover too much material in the calculus courses. This problem is exacerbated by having only 69, 70, or 71 class days in a semester rather than the 75 that we were promised. Thus I feel that we need to make an effort to relieve the problem prior to the beginning of the Fall Semester, 1989.

Approximately one year ago, I appointed an Undergraduate Program Committee and charged them with the responsibility of taking an in-depth look at our undergraduate program.

This Committee has made a recommendation for the Freshman and Sophomore Calculus courses, and this recommendation is attached. The Freshman-Sophomore Committee has recommended that discussion of the Freshman-Sophomore calculus course be postponed until Fall, 1989. There will be a faculty meeting at 4:00 P.M. on Monday, April 24 in McBryde 238 to discuss the proposal of the Undergraduate Program Committee and any other proposals concerned with the Freshman-Sophomore calculus courses that are available at that time. It is conceivable that the Undergraduate Program Committee's recommendation concerning 1215 and 1216 could be in place by Fall, 1989, but I don't believe this is the case for 2215 and 2216. Thus the discussion at this faculty meeting will begin with a discussion of 1215.

The Undergraduate Program Committee has been discussing Freshman and Sophomore Calculus. We have come up with the following items that we would like to present to a meeting of the Mathematics Faculty.

- I. Math 1215-1216: (These proposals are largely in response to the instructors' comments at a fall faculty meeting that they were having trouble covering the syllabi.)
 - A. Put the current seven lectures on Chapter 1 on tape, available to all students. Give 2-3 lectures on Chapter 1, and then have all students take a uniform, machine-graded, diagnostic test on Chapter 1 and other relevant high school mathematics. This test would probably be given Friday night, the first week of class. Those with poor scores would be required (recommended?) to change immediately to a remedial course such as 1015 or 1016. Those passing would have these test scores used as part of their 1215 grades.
 - B. Cut one day on continuity, but add one day on integral properties.
 - C. For integration techniques, spend one day each on integration by parts, trigonometric integrands, trigonometric substitution, rational integrands, and tables. (This cuts two days.) One will not be able to cover all special cases (m even $-n$ odd or $(x^2 + 4x + 1)^{-4}$, etc.), but this much exposure is sufficient in the light of current computing capabilities.
 - D. Cut Chapter 7 by two days. (Do little more than mention a^x or $\log_a x$, $a \neq e$.)
 - E. Cover Sections 16.8 and 16.9 (multivariable max/min) pretty thoroughly.
 - F. Limit tests to four per semester (not counting the diagnostic test on Chapter 1). Stress the use of questions that have a broader significance rather than a rote manipulative nature. Ask the students to perform at least one writing assignment -- force them to discuss some important concept coherently. (Example: If f is continuous on $[a, b]$, discuss why f is "essentially constant" on any sufficiently small subinterval of $[a, b]$.)
- II. Math 2215-2216: We believe this sequence would be more coherent if the topic coverage were distributed differently. Enclosed is a sample syllabus. Note this syllabus treats simple differential equations immediately, and thus eliminates the need for the 2 or 3 current "cookbook" lectures. It also leaves series and sequences for last. (We can find no necessity or outside demand to cover them earlier. Moreover, they seem to be especially troublesome at the beginning of 2215.) We have not forgotten our experience with the Rabenstein text, but we feel this approach will work nicely with the current texts. (We have a similar syllabus from the Univ. of Washington, if you wish to see it.)
- III. We envision requiring a programming course for freshman Mathematics majors, and also separate one-hour computational laboratory courses along with 2215 and 2216. We are working on two possibilities but are not ready to endorse either one just yet.

Topic Outline for Revised 2215-2216

2215

# Weeks	Topic	Book Sections
5-2/3	ODE: First order, second order and constant coefficient higher order equations.	Boyce-DiP Ch. 1, 2, 3, 5.1, 5.2, 5.3
3	Linear algebraic equations, matrices, determinants	Anton, Ch. 1, 2
3-1/3	Vector spaces (include inner product)	Anton, Ch. 4 (through 4.9)
1	Intro to Linear Transformations	Anton, Ch. 5

2216

2-2/3	Linear Transformations, eigenvalues, eigenvectors	Anton, Ch. 5, 6
2-2/3	Systems of linear ODE's	B-D, Ch. 7
2	Phase plane and nonlinear ODE's	B-D, Ch. 9
5-2/3	Infinite series and series solutions of ODE	Swok., Ch. 11 B-D, Ch. 4

Do series and sequences in 4544 also