

General Studies 2015-16 Course Review

Math 102

I. Course Description: MATH 102, Nature of Mathematics (3 or 5 hrs.)

Catalog description: A course using mathematics to expose the underlying structure of problems from common experience. Topics include linear, exponential, and logarithmic functions as they apply to real world situations. Additional topics per interest of faculty and students may include: Logic, annuities and amortization, probability, graph theory, voting theory, geometry, and methods of apportionment. Pre-requisites: Math ACT 19 or SAT equivalent for entrance into three-hour sections. Students not meeting the ACT/SAT requirement will be required to take a five-credit-hour section of this course which includes two hours of weekly recitation.

Notes: As the description reads, students scoring below ACT 19 are required to enroll in the five-credit-hour section. The two additional hours of contact in five hour sections are strategically tailored to students' needs in different ways, but generally serve to fill gaps in students' backgrounds. The five hour section is a new offering beginning fall 2015, and is intended to provide additional contact hours with faculty due to the elimination of Math 046.

II. Student Learning Outcome: Analysis; Creating Strategies and Quantitative Calculation.

The goal of Math 102 is to expose non-COS students to the usefulness and beauty of mathematics. To accomplish this, we exemplify the following process, also given in the attached course outline, in several contexts:

- A. consider a problem that naturally arises from common experience
- B. extract the essential parts
- C. use mathematical tools to analyze the parts
- D. reflect on underlying unity of problems that seem unrelated.

“Creating Strategies” in Math 102 means finding a way to adapt a given problem to a mathematical tool that we have developed (or vice versa). Also under the purview of Creating Strategies we place the process of thinking through the appropriate steps of a problem (writing nothing down) in anticipation of carrying it out. Both of these are entailed in the process listed in A)-D) above. Problems 1a) – 1c) of the attached assessment instrument [102 GS assessment Fall 2015.pdf] directly assess, in the opinion of the mathematics faculty, these targets.

Quantitative Calculation is an essential part of this course. Describing change is a major theme of the course, and always involves calculation. Calculation in Math 102 typically involves selecting an appropriate formula, extracting and inputting correct values in for the variables, and then doing the computation indicated symbolically by the formula. This is very directly assessed by problems 2a) – 2d) of the assessment instrument.

III. Course Assessment:

The assessment consists of seven multiple choice questions broken into groups of three and four, with a group used to assess each outcome. The questions are somewhat tiered in difficulty to allow differentiation of ability; scoring on the GS Analysis Rubric is given in the .pdf document just mentioned.

In all Fall 2015 sections (two 3-hour and two 5-hour sections) the questions were embedded in the final exam in a nondescript way. We are considering doing pretesting in all Spring sections of Math 102 along with final exam embedding to capture delta information. There is no variability in the assessment instrument, or in its delivery, between sections.

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Analysis; Creating Strategies and Quantitative Calculation are assessed using the problems and rubric given in the attachment [102 GS assessment Fall 2015.pdf].

IV. Course Delivery and Consistency (All sections are delivered in lecture format).

A major area of concern among math faculty was that two “versions” (3/5 hour) of the course are being offered and are being assessed in the same way. There are several confounding variables between the versions that (potentially) induce differences not only in GS assessment results but also exam scores. These variables include considerable differences in mathematical aptitude (if only as measured by ACT score) and differences in instructional time. Arguably these two cancel each other out to an extent, but how much is unclear. So, we did the following:

- A. A course outline was developed by the course coordinator outlining agreed upon policies (the outline is attached as [102 outline fall 2015.pdf] and will be updated with our findings for Spring 2016).
- B. Met biweekly the first half of the semester with all math faculty members to discuss ways to maintain uniformity, teaching techniques we are trying that have proved useful, and ways the 5 hour sections are using their recitation hours. These meetings were very productive.
- C. Developed, at the recommendation of co-chair Douglas Swartz, a materials repository containing old exams, handouts, worksheets, projects, etc. that we have used. Also in this repository are sample syllabi and the above mentioned course outline.
- D. Frequent informal discussions about the course between pairs of faculty teaching sections of 102 were held.

A variety of teaching methods are used. However, a typical lecture across the sections consists of a combination of a lecture period during which ideas and problems are motivated and exemplified, time for students to work themselves on a problem or two alone or in groups, and a summary. Variations on this would include students presenting their work on the board and presenting their work to others in groups.

During the two addition recitation hours we have mandated that homework problems are not to be worked on—for help on those, students should see their instructor during office hours. What has been done by faculty in the extra hours is diagnose and fill gaps in their background knowledge. In some cases this has involved reviewing very basic concepts such as arithmetic with fractions, order of operations, graphing functions, etc. However, this is viewed by the math faculty as a worthwhile use of the extra time, and is consistent with the notion that these hours are to some extent replacing the role of our former Math 046. Also during this time core Math 102 material is of course re-covered and practiced.

V. Course Syllabi and Documents: submitted via LiveText

VI. Comments

Math 102 is not a new course, but has undergone significant changes in the last 1.5 years. The reader is directed to the section “Overview of the course” in the course outline for perspective on the broader role of this course as it serves our students. Because of the recent changes, the course is still settling in to what it will become, but we believe it has the potential to accomplish the following:

- A. reduce anxiety through its fresh (and less-“mathy”) feel,
- B. expose students to what modern mathematics “cares about”—reducing problems to their essence and analyzing that core, and, in consequence of these two,
- C. increase retention as non-COS students have successful experiences in their general studies math course.

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As necessary to hit the target outcome, we will adjust our assessment instrument on the basis of data from the four sections that ran Fall 2015.

Note: All attachments submitted via LiveText