Mathematics/Quantitative Reasoning Competency Assessment Plan
March 15, 2002

Institution: University of Virginia – School of Engineering and Applied Science

Standards/Definition of Competency

All students graduating from the University of Virginia's School of Engineering and Applied Science (SEAS) should be able to demonstrate the ability to:

1. Use proper mathematical notation and terminology.

2. Express mathematical arguments clearly, demonstrating an understanding of what is necessary and sufficient support.

3. Solve multi-step problems.

4. Graph basic functions without a calculator. These functions include linear, factored polynomial, trigonometric, exponential, and logarithmic.

5. Compute, without a calculator, derivatives and integrals of single variable and multivariable functions.

6. Set up and solve problems involving the application of the derivative and integral in both single variable and multivariable context. Such applications must include optimization, rates of change, area, volume, arc length.

7. Set up and solve simple problems in polar and spherical coordinate systems.

8. Calculate and use the dot product and cross product.

9. Solve the differential equations $y' + y = 0$ and $y'' + y = 0$.

10. Define the concepts of linear independence; superposition.

11. Solve nth order, homogeneous constant coefficient ODEs.

12. Solve nth order, inhomogeneous constant coefficient ODEs.

Description of Measure to be Used

All undergraduates enrolled in the SEAS are required to complete APMA 212 (Multivariate Calculus) and APMA 213 (Ordinary Differential Equations). It is in these two courses that students are expected to learn the knowledge and skills in mathematics and/or quantitative reasoning described above. The final examinations in these courses are designed to test this student knowledge and skill achievement.

We will collect and copy the final examinations of approximately 20% of randomly selected students (or about 50 students total) enrolled in APMA 212 in fall 2002 as well as the final examinations for the same students from APMA 213 in spring, 2003. We will choose and train a panel of independent and knowledgeable evaluators, consisting of faculty members and/or graduate students not associated with the teaching of these courses but knowledgeable in the subject area, to assess the mathematical skills demonstrated by the final examinations. The following is an explanation of the 4,3,2,1 scale to be used in this assessment:

A SCORE OF 4, 3, 2, OR 1 will be assigned for each of the relevant skills demonstrated on that test.

A SCORE OF 4 (strong competence): A score of 4 will indicate that the student is able to solve advanced problems and express solutions clearly.

A SCORE OF 3 (reasonable competence): A score of 3 will indicate that the student is able to solve most of the problems but cannot always support solutions clearly.

A SCORE OF 2 (some competence): A score of 2 will indicate that the student understands some of the concept but is unable to carry out the specific steps clearly or accurately.

A SCORE OF 1 (little competence): A score of 1 indicates that the student does not have a basic understanding of the mathematics or the mathematical process.

Description of the Methodology to be Used to Gather Evidence of Competency:

During fall semester, 2002, the Office of Institutional Assessment and Studies will choose a random sample of not less than 20% of the students enrolled in APMA 212 (or not fewer than 50 students total). Final Examinations will be collected for these students at the end of the semester, 2002, and then again for the same students enrolled in APMA 213 at the end of spring semester, 2003.   The examinations will be copied prior to their being graded by the course instructors, and the names of the students will be removed to assure privacy and anonymity. At no time will it be possible to associate assessment results with the names of students.

During spring semester, 2003, we will select and train an independent panel of faculty members and/or graduate students to serve as a committee to conduct the assessment. This committee will review the final examinations after they have been prepared to assure that questions on the examinations require students to demonstrate the knowledge and skills listed above, and to identify specifically those questions. Members of the committee then will review the copies of the completed final examinations to determine the level of student achievement of the knowledge and skills listed above. Each examination will be assessed by two evaluators, and, in the event of disagreement on the scores assigned, the two scores will be averaged. The assessments will take place as soon after the end of spring semester, 2003 as possible so that we can report the assessment results by July 1, 2003. The assessment of student competency in mathematics/quantitative reasoning will take place every three years thereafter.

We will provide the results of the mathematics/quantitative reasoning assessment to the appropriate administrators and faculty members in the SEAS so that those results can be used to assess the quality of the relevant areas of the curriculum as well as the quality of teaching in those areas.

Plan for how results of the competency assessments will be described in a way that will be meaningful to the various publics with a stake in the quality of Virginia higher education.

The University will describe the mathematics/quantitative reasoning assessment results for the SEAS as follows:

1. A description of the SEAS' expectations for student learning in this area.
2. A description of how students are taught or can learn the knowledge and skills required.
3. A description of the assessment process.
4. The percentage of students that were determined by the evaluators to fall within each of the categories of the 4-point scale described above.

Submitted by: _____
                Vice President and Provost