A. Current Makeup of Department

The department has seven full-time faculty members. Currently there are three (3) tenure track lines in mathematics, three (3) tenure track lines in computer science, one (1) tenure track line in statistics. There is one part-time member, the Director of Computational Science, who beginning 2008-09 teaches two (2) courses per year.

In the Spring of 2006 a long-standing three-year visiting position in mathematics was cut. This occurred as the department was petitioning the EPC to convert the three-year visiting position in mathematics to a tenure line in mathematics.

In the Fall of 2007 the EPC forwarded a recommendation to the Provost that the department be allowed a 4th tenure line in mathematics. The Administration has not acted on this recommendation.

Since the visiting position cut in 2006 the department has used the equivalent of more than one full time equivalent (FTE) of part-time adjuncts and overloads to teach courses in the department.

Two course offered by the department. MTH 118: Math for Elementary/Middle School Teachers and MTH 119: Geometry w/ Computer Applications are taught by members of the Education department and do not figure in this assessment.

B. Student Constituencies

Courses offered by the Department of Mathematics and Computer Science serve four easily identifiable groups of students

1. Students who need to satisfy their “Q” or “M” Gen Ed requirements. This is every student at Wittenberg.

2. Majors in Mathematics or Computer Science: Within this group are two easily identifiable subgroups: students who seek licensure to teach high school mathematics and students who will apply to graduate programs.

3. Minors in Mathematics, Computer Science, Statistics, or Computational Science

4. Students who are not majors or minors in our department but who are required to take courses in mathematics, statistics or computer science for their major (service courses for other departments/programs).

C. Learning Goals for majors, minors, and non-majors; Gen Ed requirements

1. Learning Goals for in Major in Mathematics

Mathematics majors should:

a. Have a basic understanding of the areas of modern mathematics that are generally acknowledged as fundamental to the study of undergraduate mathematics. These include:

i. differential and integral calculus and its applications
ii. discrete mathematical modeling
iii. logic and set theory
iv. topological and algebraic properties of the real number system
v. theory and techniques associated with abstract vector spaces
vi. abstract algebra, particularly group theory
vii. theoretical foundations of single variable calculus

b. Be able to use the techniques of discrete and continuous mathematical modeling to formulate and solve problems.

c. Understand the essentials of logic, reasoning and mathematical proof as well as how to use definitions, state axioms and prove theorems.

d. Understand the use of symbolic, numeric and graphical methods to formulate and solve problems.

e. Be able to use modern technology as a tool to understand and solve mathematical problems.

f. Be able to undertake independent work, to study and explore new ideas and areas of mathematics, and to continue to do so after graduation.

2. Learning Goals for the Major in Computer Science

Computer science majors should gain an understanding of:

a. The use of the computer to solve problems. These problems relate to problem analysis, data manipulation, information storage and retrieval, and programming.

b. The computer's history, its place in society, its strengths, and its limitations.

c. The essentials of mathematical analysis and modeling, along with appropriate mathematical reasoning and problem-solving skills.

They should also:

d. Learn the systematic study of the computer, algorithms and data structures. This is done by the study of formal properties, implementation through various computer languages and architectures, and applications in solving important problems in a variety of disciplines

e. Develop an ability to design, develop, evaluate and document computer programs, in a high-level computing language, that can be used to efficiently solve various types of symbolic and numeric processing problems

f. Learn and apply the scientific approach (treating the computer as a scientific instrument). This requires factual, operational, and experimental knowledge of the computer.

g. Understand the important principles of algorithms, computer architectures, operating systems, and computer languages.

h. Develop an ability to communicate clearly and effectively through writing and speaking.

i. Gain experience in pursuing specialized computer science topics in depth through independent reading and research, and through group activities.

3. Learning Goals for the Mathematics Minor
Mathematics minors should:

a. Have a basic understanding of the following areas of modern mathematics:
   i. differential and integral calculus and its applications
   ii. discrete mathematical modeling
   iii. logic and set theory
   iv. topological and algebraic properties of the real number system

b. Be able to use the techniques of discrete and continuous mathematical modeling to formulate and solve problems.

c. Understand the essentials of logic, reasoning and mathematical proof as well as how to use definitions, state axioms and prove theorems.

d. Understand the use of symbolic, numeric and graphical methods to formulate and solve problems.

e. Be able to use modern technology as a tool to understand and solve mathematical problems.

4. Learning Goals for the Computer Science Minor

Computer science minors should gain an understanding of:

a. The use of the computer to solve problems. These problems relate to problem analysis, data manipulation, information storage and retrieval, and programming.

b. The computer's history, its place in society, its strengths, and its limitations.

c. The essentials of mathematical analysis and modeling, along with appropriate mathematical reasoning and problem-solving skills.

They should also:

d. Learn the systematic study of the computer, algorithms and data structures. This is done by the study of formal properties, implementation through various computer languages and architectures, and applications in solving important problems in a variety of disciplines

e. Develop an ability to design, develop, evaluate and document computer programs, in a high-level computing language, that can be used to efficiently solve various types of symbolic and numeric processing problems

f. Learn and apply the scientific approach (treating the computer as a scientific instrument). This requires factual, operational, and experimental knowledge of the computer.

g. Develop an ability to communicate clearly and effectively through writing and speaking.

5. Learning Goals for the Statistics Minor

Statistics Minors should:

Understand statistics as the science of using empirical observation to inform one's understanding of the world. To this end, students must learn the fundamental principles for

a. effectively organizing and summarizing data,

b. designing appropriate observational studies and experiments,
c. constructing and assessing data-based models of real-world phenomena, and
d. knowing what conclusions can and cannot be drawn from data.

In the application of these principles, students must

e. learn the appropriate use of the more common statistical tools and methods and
f. recognize the abuses and limitations of these tools.

In all of these pursuits, students are expected to

g. make extensive use of appropriate statistical software and other computing technology,
h. articulate their ideas both in technical and in non-technical written and oral form, and
i. apply their statistical expertise to study in the major discipline.

6. Learning Goals for the Computational Science Minor

Computational science minors should:

a. Treat computational science as a new paradigm for understanding the natural world.
b. Use observation, modeling, computational software (numeric and symbolic), visualization tools, and analysis to improve this understanding.
c. Learn and apply the classes of mathematical computer models (continuous vs. discrete, static vs. dynamic, and deterministic vs. stochastic) toward the solution of computationally intensive science problems.
d. Become familiar with the use of approximation techniques, simulation, and optimization methodologies, as well as the limitations of these approaches.
e. Gain experience in laboratory work and apply the scientific method in their studies and research.
f. Be able to communicate effectively through writing and speaking and to articulate their ideas both in technical and in non-technical form.

They should also be able to:

g. Understand the fundamentals of algorithm design and the implementation of algorithms through the use of high-level programming languages and tools.
h. Understand the fundamentals of discrete and continuous mathematics, including differential and some integral calculus, and be able to apply these fundamentals in problem solving situations.

7. General Education Requirements: Q and M Courses

From Wittenberg’s Catalog

“Mathematics: The student should achieve a level of competence in mathematics that provides the necessary foundation for subsequent college learning and should also strengthen problem-solving and reasoning skills through continued use.

Requirement:
1. Demonstrate competence in mathematics. Competence may be demonstrated by completing one course (four semester hours) during the first three semesters in mathematics, statistics, or computer science that meets the foundational mathematics goals with a minimum grade of C- or S; or by earning a sufficiently high score on an examination administered on campus by the Department of Mathematics and Computer Science. Quantitative courses are designated with a “Q” in the course number.

2. Complete one additional mathematical-reasoning-intensive course. Mathematical-reasoning-intensive course may be used to meet other general education learning goals. Mathematical-reasoning courses are designated with a “M” or “Z” in the section number throughout the Master Schedule of Classes published each semester by the Registrar’s Office.

D. Assessment Methods

The department currently uses two instruments for assessment of major; minors are not assessed.

1. Every senior major is required to take the ETS Major Field Test.

"The Major Field Tests are objective, end-of-program tests .... Based on the Graduate Record Examination Subject Test they have been shortened to two hours each, made less difficult than the GRE tests, and revised to reflect undergraduate programs and to be appropriate for all seniors majoring in a field, not just those planning graduate study.

Score on these tests provide useful information for institutions seeking outcomes measures, for departments in evaluating their curriculum, and for faculty in measuring the progress of their students and considering curriculum changes." (from Major Field Tests Program Manual)

A copy of an Excel Spreadsheet summary of the results for the years 2005 – 2009 is attached to this report.

The department has been very careful to insure that every student major takes the ETS test.

2. Every senior major is required to fill out the department generated “Assessment Survey of Learning Goals for Mathematics Majors” if they are a mathematics major or the “Assessment Survey of Learning Goals for Computer Science Majors” if they are a computer science major.

Both surveys are based on the learning goals for mathematics majors and computer science majors respectively. Copies of both surveys are attached to this report.

Unfortunately the department has been less successful in insuring that every senior takes the assessment survey; we have less completed forms than seniors who graduated. Not only are we are missing survey forms, because the forms to have a line for the date, we are unsure which class a particular form belongs to.

Spreadsheet summaries of the mathematics survey form and the computer science survey form are attached to this report. Summaries of the forms collected from mathematics majors from the classes from 2005 – 2009 are in one spreadsheet. At this time we only have summaries for the computer science majors for the classes from 2005 and 2006.

E. Changes to be implemented/ What needs to be done

In 2007-08 we changed the requirements for both majors.

In mathematics for the B.A. degree we introduced three tracks – a statistics track, an applied mathematics track, and a traditional track (for lack of a better name) which were old B.A. degree requirements.

In computer science for the B.A. degree we reduced the number of math courses from four (4) to two (2) and added a new required “core” course, Comp 253: Principles of Software Design
Neither learning goals for the mathematics major or the computer science major have been updated to reflect changes to the majors.

Neither of the assessment survey of learning goals has been updated to reflect these changes; in a word, both are obsolete.

What needs to be done

1. Departmental Learning Goal Revisions

1a. Update the learning goals for mathematics majors and the computer science majors to bring them in line with the 2007-08 revisions to both the majors.

1b. Update the learning goals for mathematics minor and the computer science minor to bring them in line with the 2007-08 revisions to both the minors.

1c. Update the learning goals for the statistics minor to bring them in line with the Spring of 2006 revision of the Statistics minor.

1d. Although no changes were made to departmental minors in computational science given that the program is new and has had a chance to mature, consider revisiting the learning goals to see if they are still appropriate.

2. Revisit/augment the use of the ETS Major Field Tests

Preface: It is my belief that we should stay with using the ETS Major Field Tests since it gives us a rough way to compare our students against a national norm. However, the ETS test might not be an appropriate instrument for gauging how well our program works for statistics and applied mathematics track students. By extension we might even raise the question if it’s an appropriate instrument to assess our traditional track mathematics majors and our computer science majors.

2a. Consider an alternate or supplementary evaluation instrument for statistics and applied mathematics track math majors. This would be part of the capstone experience.

2b. Consider a supplementary evaluation instrument (e.g. our own comprehensive examination) for traditional track mathematics majors and computer science majors. This would be part of the capstone experience.

3. Assessment survey form revisions

3a. Given the changes to the mathematics and computer science majors, the current assessment survey forms need to be revised.

3b. Since the computational science minor has a capstone requirement, consider including a learning-goals-based assessment element to the computational science capstone.

Note: Given that our minors in mathematics, computer science, and statistics minors do not have a built-in capstone experience, even assuming a desire to add an assessment element to them, I see no practical way to do so.

F. Plan for Continuous Assessment