# Assessment Report: Mathematics Learning Outcomes
## Fall 2014

**Fall 2014 Assessment Results**

According to the below description of Mathematics Program Learning Outcomes and Assessment, 21 students were assessed for Outcome 5C in M 454.

Outcome: Students should demonstrate the ability to prove basic mathematical propositions and generate computations in Dynamical Systems.

10 students scored Excellent, 5 students were Acceptable, 3 scored on a marginal level and 3 were Unacceptable. Since more than half of the majors scored on Excellent or Acceptable level, the assessment of the course is positive.

Recommendations: If the size of the class permits, a more emphasis can be placed on correct mathematical arguments in graded homework. Current size of the class (more than 30 students) makes this very difficult.

## Program Learning Outcomes

Students should demonstrate the ability to prove basic mathematical propositions and generate computations related to (1)-(4) and at least two of (5A)-(5C):

1) Sets and sequences of real numbers, and functions and derivatives of real-valued functions of one real variable
2) Series of real numbers, sequences of real-valued functions of one real variable and their Riemann integrals
3) Linear transformations, their matrix representations and their eigenspaces
4) Abstract algebraic structures
5) (A) Applied mathematics
   (B) Numerical analysis
   (C) Dynamical systems

## Curriculum Map and Assessment Schedule

| | Outcomes | | | | | | | Assessment Schedule |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5A | 5B | 5C | |
| M 333, Linear Algebra | | | X | | | | | Even fall semesters |
| M 383, Introduction to Analysis I | X | | | | | | | Odd fall semesters |
| M 384, Introduction to Analysis II | | X | | | | | | Even spring semesters |
| M 431, Abstract Algebra I | | | | X | | | | Odd spring semesters |
| M 441, Numerical Linear Algebra and Optimization | | | | | | X | | Odd fall semesters |
| M 442, Numerical Solution of Differential Equations | | | | | | X | | Even spring semesters |
| M 450, Applied Mathematics I | | | | | X | | | Every 4th fall, begins F13 |

| Course | | | | | | | | Schedule |
|---|---|---|---|---|---|---|---|---|
| M 451, Applied Mathematics II | | | | | X | | | Every 4$^{th}$ spring, begins S14 |
| M 454, Introduction to Dynamical Systems I | | | | | | | X | Every 4$^{th}$ fall, begins F14 |
| M 455, Introduction to Dynamical Systems II | | | | | | | X | Every 4$^{th}$ spring, begins S15 |

## Rubric

| Learning Outcome | Unacceptable | Marginal | Acceptable | Excellent |
|---|---|---|---|---|
| *(1)-(5C) Prove basic mathematical propositions.* | The work is not logical and complete because either terms are used improperly or key ideas are missing or organization is unlikely to result in a correct proof even if a few more ideas are inserted. | The work is not correct and complete because key ideas are missing, but the terms are properly used and the work shows a type of organization that might work if the right ideas were inserted in the proper places. Also, the work is "marginal" if most of it leads toward a correct proof, but a false statement is inserted. | The work is almost correct with relevant terms used and ideas that work, but not well-organized; for example, with some steps out of order, or with something relatively minor incomplete. | The work is fully correct and complete, with the relevant terms properly employed and ideas that work, and the steps well-organized into a logical sequence. |
| *(1)-(5C) Generate computations.* | If the work is not correct and complete because either there are fundamental gaps in understanding the underlying mathematical methods or there are two or more significant errors in the computations. | The work is not correct and complete because a significant component of the analysis is missing or incorrect, but most of the components are present. | The work is almost correct with the appropriate methods employed but with a minor error or misunderstanding of one part of the computations. | The work is fully correct and complete and displays full understanding of the appropriate mathematical methods. |

## Threshold

At least half of the majors in each of the courses are assessed as "excellent" or "acceptable" for all the learning outcomes.