



Mathematics | 2017-2018 Assessment Report

Please give a brief overview of the assessment data you collected this year.

The assessment data was collected through

- MATH 328 Introduction to Algebraic Structures for Fall 2017
- MATH 324 Analysis II for Spring 2018

They are required courses for Mathematics majors with a Mathematics emphasis and an elective course for Mathematics minors with a Mathematics emphasis. The following outcomes were assessed:

- **LO1.** Mathematics majors will be able to understand the important mathematical/statistical concepts, theorems, formulas, computational techniques and axiomatic systems in the required courses.
- **LO2.** Mathematics majors will be able to demonstrate the ability to follow, construct, and write mathematical proofs.
- **LO4.** Mathematics majors will be able to pose mathematical/statistical problems, and select and apply appropriate mathematical/statistical theories, models and tools to solve and/or analyze the problems.

Additional assessment data was collected through

- MATH 430 Design of Experiments for Spring 2018

MATH 430 is an elective course for both Mathematics majors and minors with a Statistic Emphasis. The following learning outcomes were assessed:

- **LO1.** Mathematics majors will be able to understand the important mathematical/statistical concepts, theorems, formulas, computational techniques and axiomatic systems in the required courses.
- **LO4.** Mathematics majors will be able to pose mathematical/statistical problems, and select and apply appropriate mathematical/statistical theories, models and tools to solve and/or analyze the problems.
- **LO 5.** Demonstrate their understanding of how mathematics/statistics is used in the solution of real-world problems.
- **LO 6.** Use technological aids appropriately in the study of mathematics/statistics and properly interpret and assess the computed results.

MATH 328 Introduction to Algebraic Structures (Fall 2017)

1. It includes interdisciplinary contents that explore many topics within mathematics including Calculus, Linear Algebra, Number Theory, Topology, and Geometry. Students will apply them to the areas of Abstract Algebra. So, this course is a purely disciplinary course in Mathematics. It is problem-focused.
2. There were 10 students (1 junior and 9 seniors) who started the course for fall 2017. All of the passed the course successfully with grade B or above.
3. All the students were Mathematics majors with 1 or more other majors/minors (Global Studies, Education, Business Administration, Accounting, Physics, Environmental Science, Humanistic Studies, History, Economics, Mechanical Engineering Technology).
4. The assessment included a combination of three midterms and the final. Attendance was also required and worth 1/11 of the final grade.
5. All the assignments and exam problems were free-response, mostly consisting of proofs.
6. Students had to demonstrate the ability to follow, construct, and write mathematical proofs using knowledge derived from the major content areas of Abstract Algebra (Group Theory, Ring Theory, Vector Spaces, and Field Theory).

MATH 324 Analysis II (Spring 2018)

1. This is the second course of a two-semester sequence on foundations of real analysis that focuses on rigorous proof-based treatment of abstract mathematical concepts from the theory of functions of a real variable.
2. It is a disciplinary problem-focused course with a strong emphasis on critical and analytical thinking and proof writing.
3. Students had to demonstrate the ability to follow, construct, and write mathematical proofs using knowledge derived from the major content areas of calculus and real analysis (limits, sequences, series, and their generalizations to real-valued functions, continuity of a function, the theory of differentiation, and the theory and development of the Riemann integral).
4. The following format of the class was used: a lecture followed by a small-group work/discussion session, and concluding with student group presentations.
5. The assessment includes a combination of ten in-class quizzes, one midterm exam, and the final exam. All the quiz and exam questions are free-response, mostly consisting of proofs.
6. There were 10 students (3 juniors and 7 seniors) who started and finished the course.
7. All 10 students are Mathematics majors; 9 students have one or more other majors and/or minors (Business Administration, Economics, Education, Physics, Humanistic Studies, Dance).
8. Nine students passed the course with a grade of C (1 student) and above. One student received a grade of D.

MATH 430: Design of Experiments (Spring 2018)

1. This course focuses on analyzing designed (as opposed to observational) studies in areas such as agriculture, engineering, manufacturing, and the biomedical field (LO 5). It is largely an applied course that utilizes algebra, calculus, and linear algebra to introduce the theory/concepts behind the tests/models.
2. A major component of the course is running statistical tests/models in the statistical program SAS, a high-level programming language. The challenge is knowing: 1) how the data were collected, 2) the appropriate test/model for such data, 3) how to code the relevant test/model in SAS, and 4) how to correctly interpret SAS's output in the context of the study at the level required for publication or a report to a supervisor. These objectives align with LOs 1, 4, 5, and 6.
3. Students are assessed throughout the semester with seven homework assignments (all of which include coding in SAS), two exams (not cumulative), and a cumulative final exam during finals week. Exams involved analyzing datasets in SAS in real time during the class period, as well as answering conceptual questions and those involving hand calculations.
4. There were six students who began and finished the course: one in high school ("Undergraduate Special - Youth Options Program"), two juniors, and three seniors. Students' majors were:
 - a. Mathematics Major, Statistics Emphasis: 2 students
 - b. Mathematics Major, Mathematics Emphasis: 2 students (course served as a replacement for an upper-level math elective, as the course they would normally take was canceled due to low enrollment)
 - c. Computer Science Major; Mathematics Minor, Statistics Emphasis: 1 student
 - d. High school (no major): 1 student
5. All students achieved at least a C in this course this semester (breakdown of grades given below). One student who achieved a C had various personal issues out of his/her control that precluded him/her from devoting the necessary time to this course at the beginning of the semester. However, this student worked diligently to catch-up, and the work during the second half of the course was usually at the A level.
 - a. A: 3 students
 - b. BC: 1 student
 - c. C: 2 students

How will you use what you've learned from the data that was collected?

MATH 328 Introduction to Algebraic Structures (Fall 2017)

1. The students achieved an average score of 90.7%
2. The data shows that all the students were clear in understanding about most of the important concepts and skills. Their skills at proof writing were sufficient and no extra attention was needed.
3. All the students only missed one or none class throughout the semester. Compare to previous assessments, students' achievement level is higher. Therefore, we still concluded that students' performance in the course had a strong positive correlation with their attendance.

4. The implementation of LO1, LO2, LO4 were satisfactory for fall 2017.

MATH 324 Analysis II (Spring 2018)

1. The average score that the students achieved was 80.5%.
2. Nine students out of 10 attended class regularly and actively participated in in-class activities and discussions. One student did not attend the major portion of class meetings and missed 40% of in-class quizzes. That student periodically informed me via email about his/her absences and that he/she followed course materials posted on D2L.
3. The data shows that 8 out of 10 students demonstrated good comprehension of the course material and the ability to rigorously proof/disprove basic results in real analysis. The student who received a grade of D did not attend class regularly and missed 4 out of 10 quizzes. His/her grade on the attempted quizzes and exams is C. Both students who received a grade of C and a grade of D needed to put more efforts into mastering the course material to achieve better results.
4. The learning outcomes LO1, LO2, and LO4 were satisfactorily implemented in Spring 2018 semester. According to the recent changes in Mathematics program, MATH 324 Analysis II course will be deactivated starting 2018-2019 academic year. The new one-semester course MATH 323 Analysis has been developed to replace MATH 323 Analysis I and MATH 324 Analysis II sequence.

MATH 430: Design of Experiments (Spring 2018)

1. Students achieved an average course score of 85.99% (SD: 11.22%), with a median of 86.41%.
2. All students attended class and handed in assignments regularly.
3. As mentioned above, one student who received a C did so due to a difficult start to the semester, while later work was usually at the A level. The other student who received a C chose not to devote the time necessary to this course (although he/she was present and participated in class, and attempted all assessments).
4. Given student grades and informal feedback, learning outcomes 1, 4, 5, and 6 were satisfactorily implemented for MATH 430 in Spring 2018, and thus no changes for this course or these LOs in this course are planned at this time.