

Mathematics BA Curriculum Mapping

Table 1 Student Learning Outcomes for Mathematics Undergraduates	
1.	To achieve mastery of basic mathematical ideas and techniques ranging across different fields.
2.	To think analytically and critically to formulate problems, solve them, and interpret their solutions.
3.	To develop a sophisticated understanding of the nature of proof.
4.	To use technology as a meaningful tool in formulating and solving problems.
5.	To apply knowledge from one branch of mathematics to another and from mathematics to other disciplines.
6.	To communicate mathematics effectively both orally and in writing.
7.	To develop essential information skills, including determining, accessing, and using electronic and printed information appropriately and professionally.

Seven student learning outcomes (SLOs) have been identified as being essential for all majors in mathematics (Table 1).

Curriculum Maps

A curriculum map (CM) was developed for each of the four undergraduate concentrations assessing the extent to which each of these learning outcomes is introduced (I), developed (D), or mastered (M) in the degree program. Please note that courses are listed in the order in which they are typically taken including the core courses. We conclude this section with a critical discussion of how the curriculum map may help inform the Department's programs for the next evaluation cycle.

The Pure Mathematics Concentration is designed primarily for students interested in pursuing a graduate degree in some area of pure mathematics. The curriculum map for this concentration shows that the concentration emphasizes fundamental components for theoretical mathematicians, including analytical thinking and proof construction (Table 2).

Table 2 Department of Mathematics Curriculum Map of Outcomes: The Pure Concentration							
Course	1 Basic Ideas	2 Analytical Thinking	3 Proof	4 Tech Tools	5 Application	6 Communication	7 Info Skills
150A	I	I	I	I	I	I	I
150B	I	I	I		I		
250A	I	I	I	I	I		
250B	I	D	I		I		
Cognate	I	D			D		I
280	D	D	D	I, D		I	
307	D, M	D	D			D	
320	D	D		D	D		D
380	D	D	D	D	D	D, M	D, M
302	D	D	D			D	
350	M	D	M			D	
407, 471*	M	M	M			M	
430*	M	M	M				
412*	M	M	M		M		
425*	M	M	M			M	M

*Note: Four of Math 407, 471, 430, 412, and 425 are taken.

The Pure Concentration CM shows strength at the mastery level in SLO 1, 2, and especially 3 regarding the emphasis on mathematical proof. This outcome is perhaps the most critical area for the student intent on pursuing graduate school in pure mathematics. The CM also shows mastery level in SLO 5, 6, and 7. The CM identified relative weakness in SLO 4, the use of Technological Tools. This is an emerging area in pure mathematics, with computer applications being very topic-specific, such as applications to number theory, combinatorics, or coding theory. This is an area that will be reviewed for strengthening in our program for pure mathematics majors, including the increased use of mathematical writing software such as *LaTeX*.

The Applied Mathematics Concentration is designed for students planning to use mathematics in a career in business, industry, or government, or to pursue graduate studies in applied mathematics. Since this area substantially diverges in its theoretical and applied underpinnings, the Department offers two separate tracks in the Applied Concentration: (I) the Modeling and Computing Track and (II) the Classical Track. A separate CM is given for each track (Tables 3 and 4).

Courses	1 Basic Ideas	2 Analytical Thinking	3 Proof	4 Tech Tools	5 Application	6 Communications	7 Info Skills
150A	I	I	I	I	I	I	I
150B	I	I	I		I		
250A	I	I	I	I	I		
250B	I	D	I		I		
Cognate	I	D			D		I
280	D	D	D	I, D		I	
307	D, M	D	D			D	
335	I, D	D	I, D		I, D		
306	D	D	I, D	I, D	D		
310	D	D	I, D	D	D		
320	D	D		D	D		D
380	D	D	D	D	D	D, M	D, M
340	D	D		D	D		
370	D	D		D	D	D	D
350	M	D	M			D	
406*	D, M	M		D	D		
440*	M	M		M	M	M	M
470*	M	M		M	M	M	M

*Note: Two of Math 406, 440, and 470 are taken.

The CM shows strength in SLO 1, 2, and 4, with mastery level in each of the other areas. Math 440 and/or 470 serve essentially as capstone courses in this concentration and aim to ensure mastery level in most of the outcomes.

Table 4 Department of Mathematics Curriculum Map of Outcomes: The Applied Concentration II: Classical Track							
Courses	1 Basic Ideas	2 Analytical Thinking	3 Proof	4 Tech Tools	5 Application	6 Communications	7 Info Skills
150A	I	I	I	I	I	I	I
150B	I	I	I		I		
250A	I	I	I	I	I		
250B	I	D	I		I		
Cognate	I	D			D		I
280	D	D	D	I, D		I	
307	D, M	D	D			D	
306	D	D	I, D	I, D	D		
310	D	D	I, D	D	D		
320	D	D		D	D		D
380	D	D	D	D	D	D, M	D, M
302	D	D	D			D	
350	M	D	M			D	
406	D, M	M		D	D		
425	M	M	M			M	M
412, 414 450*	M	M	M				

*Note: Two of Math 412, 414, and 450 are taken.

The CM shows strength in SLO 1, 2, and 3, with mastery level in SLO 6 and 7 achieved as well. The CM identified relative weakness in SLO 4 and 5, the use of Technological Tools and the generation of Applications. As with the Pure Concentration, the Classical Track emphasizes the theoretical aspect of applied mathematics. This is an area that will be reviewed for strengthening, including the increased use of mathematical software such as *Mathematica*.

Table 5 Department of Mathematics Curriculum Map of Outcomes: The Teaching Mathematics Concentration							
Courses	1 Basic Ideas	2 Analytical Thinking	3 Proof	4 Tech Tools	5 Application	6 Communication	7 Info Skills
150A	I	I	I	I	I	I	I
150B	I	I	I		I		
250A	I	I	I	I	I		
250B	I	D	I		I		
Cognate	I	D			D		I
280	D	D	D	I, D		I	
335	I, D	D	I, D		I, D		
338	I, D	D		D	D	D	D
307	D, M	D	D			D	
320	D	D		D	D		D
380	D	D	D	D	D	D, M	D, M
302	D	D	D			D	
350	M	D	M			D	
407,414, 417*	M	M	M			M	
430, 471*	M	M	M				
401	M	M	M		M	M	M
402	M	M	M	M	M	M	M

*Note: Two of Math 407, 414, 417, 430, and 471 are taken.

The Teaching Mathematics Concentration is intended for the student planning to teach mathematics at the secondary or community College level (Table 5).

The CM shows mastery in each of the seven outcomes. This concentration requires four 400-level courses, including Math 401 and Math 402. Math 401 and 402 serve as capstone courses and together address all of the learning outcomes in depth.

Table 6 Department of Mathematics Curriculum Map of Outcomes: The Probability and Statistics Concentration							
Courses	1 Basic Ideas	2 Analyt Thinking	3 Proof	4 Tech Tools	5 Application	6 Communication	7 Info Skills
150A	I	I	I	I	I	I	I
150B	I	I	I		I		
250A	I	I	I	I	I		
250B	I	D	I		I		
Cognate	I	D			D		I
280	D	D	D	I, D		I	
307	D, M	D	D			D	
335	I, D	D	I, D		I, D		
390*	D	I, D		I, D	D		
338	I, D	D		D	D	D	D
340*	D	D		D	D		
370*	D	D		D	D	D	D
380	D	D	D	D	D	D, M	D, M
350	M	D	M			D	
439	M	M	D	D, M	M	D, M	D, M
436	M	M		M	M	M	M
435	M	M	M		M		
438	M	M	M		M		

*Note: One of Math 340, 370, and 390 is taken.

The Probability and Statistics Concentration is designed to give students a sound preparation for graduate study in statistics or a career in statistics, actuarial science, or other statistics-based fields (Table 6).

The CM shows mastery in each of the seven outcomes. This concentration requires four 400-level courses, which, collectively, address each of the learning outcomes in depth.

Summary

The development of the CMs has helped to identify both strengths and weaknesses in each of the four concentrations. The Teaching Concentration, Probability and Statistics Concentration, and Applied Mathematics Concentration: Modeling and Computing Track show evidence of mastery level in each of the Department's seven student learning outcomes. The Applied Mathematics Concentration: Classical Track and the Pure Concentration show relative weaknesses in SLO 4, the use of Technological Tools, and SLO 5, Applications Within and Across Disciplines. The curriculum for these two concentrations will be reviewed by the Department during the next PPR cycle.