

College of Sciences
Department of Mathematics and Computer Science

Assessment Plan
Mathematics

Programs:

Mathematics offers the following instructional programs:

1. Bachelor of Science in Mathematics – Option A
2. Bachelor of Science in Mathematics – Option B, Applied Mathematics
3. Bachelor of Science in Mathematics – Option C, Mathematics Teaching
4. Master of Science in Mathematics – Option I
5. Master of Science in Mathematics – Option II, Mathematics Teaching
6. Master of Science in Mathematics – Option III, Applied Math Option

Institutional Learning Outcomes (ILOs):

Graduates of CSUEB will be able to:

1. think critically and creatively and apply analytical and quantitative reasoning to address complex challenges and everyday problems
2. communicate ideas, perspectives, and values clearly and persuasively while listening openly to others
3. apply knowledge of diversity and multicultural competencies to promote equity and social justice in our communities
4. work collaboratively and respectfully as members and leaders of diverse teams and communities
5. act responsibly and sustainably at local, national, and global levels
6. demonstrate expertise and integration of ideas, methods, theory and practice in a specialized discipline of study

Program Learning Outcomes (PLOs):

Bachelor of Science in Mathematics

Students graduating with a Bachelor of Science in Mathematics will be able to:

1. Apply the definitions, techniques and theorems of abstract mathematics
2. Apply the definitions, techniques and theorems of applied mathematics
3. Apply mathematical algorithms to solve problems, both individually and in teams

4. Creatively conjecture and rigorously write, analyze and critique proofs
5. Communicate mathematics to others in written and/or oral form with precision, clarity and organization
6. Apply techniques of at least one area of mathematics in depth

ILO #1 is addressed by PLOs #1-6

ILO #2 is addressed by PLOs #3 & 5

ILO #4 is addressed by PLO #3 & 5

ILO #6 is addressed by PLOs #1-6

Students taking Option B or C for the Bachelor in Mathematics receive focused emphasis on particular PLOs as follows:

- The Applied Mathematics Option emphasizes PLOs #2, 3 & 6 above.
- The Mathematics Teaching Option emphasizes #1, 2, & 5 above.

Masters of Science in Mathematics

Students graduating with a Masters of Science in Mathematics will be able to:

1. Students will be able to apply the fundamental definitions and theorems of pure mathematics
2. Students will be able to apply the fundamental definitions and theorems of applied mathematics
3. Students will be able to apply advanced techniques of mathematical analysis
4. Students will be able to apply techniques of advanced algebra
5. Students will be able to apply advanced techniques of geometry and topology
6. Students will be able to use mathematical algorithms

ILO #1 is addressed by PLOs #1-6

ILO #2 is addressed by PLOs #1 & 2

ILO #4 is addressed by PLO #3 - 5

ILO #6 is addressed by PLOs #1-6

Students taking Option B or C for the Masters in Mathematics receive focused emphasis on particular PLOs as follows:

- The Applied Mathematics Option emphasizes PLOs #2, 3 & 6 above.
- The Mathematics Teaching Option emphasizes #1, 2, 4 & 5 above.

Degree Maps (Course by Program):

SEE APPENDIX I

Curricular Maps (Course by PLO):

Bachelor of Science in Mathematics
SEE APPENDIX II

Bachelor of Science in Mathematics with Applied Math Option
SEE APPENDIX III

Bachelor of Science in Mathematics with Math Teaching Option
SEE APPENDIX IV

APPENDIX I

Assessed through Mathematics B.S. program
Assessed through Mathematics M.S. program
Assessed by other programs, or a service course

KEY:

- R** course is required by the program
- S** course is in an elective sequence
- *** course is an elective in the program

	B.S. in Mathematics Options			Graduate Programs	
	Pure	Applied	Teaching	Pure	Applied
Math1110 The Nature of Mathematics	service course for non-majors				
Math1130 College Algebra					
Math1300 Trigonometry and Analytic Geometry	service course for non-majors				
Math1304 Calculus I	R	R	R		
Math1305 Calculus II	R	R	R		
Math1810 Math for Business and Social Sciences	Service course for non-majors				
Math2011 Number Systems	Service course for non-majors				
Math2101 Linear Algebra	R	R	R		
Math2150 Discrete Structures	R	R	R		
Math2304 Calculus III	R	R	R		
Math2305 Calculus IV	R	R	R		
Math3000 Intro to Abstract Math and Proofs	R	R	R		
Math3100 Linear Algebra	R	R	R		
Math3121 Abstract Algebra I	R	R	R		
Math3122 Abstract Algebra II	R	S	*		
Math3151 Combinatorics	S	S	*		
Math3215 Geometry I	S	*	R		
Math3300 Analysis I	R	R	R		
Math3301 Analysis II	R	S	*		R
Math 3320 Calculus of Vector Functions	*	*	*		
Math3331 Differential Equations	R	R	R		
Math3361 Ordinary Differential Equations	S	S	*		
Math3600 Number Theory	*	*	R		
Math3750 Numerical Analysis I	S	S	*		R
Math3841 Linear Programming	S	S	*		R
Math3865 Mathematical Modeling	*	*	*		
Math3875 Mathematical Physics	*	*	*		
Math4012 Geometry and Measure	Service course for non-majors				
Math4013 Statistics, Data Analysis and Probability	Service course for non-majors				
Math4014 Algebra and Functions	Service course for non-majors				
Math4030 Advanced Study of School Mathematics	Service course for non-majors				

Math4040 History of Mathematics	*	*	R		
Math4100 Mathematical Logic	*	*	*		
Math4121 Advanced Algebra	*	*	*	R	
Math4151 Graph Theory	*	S	*		
Math4215 Topics in Geometry	S	*	S		
Math4235 Introduction to Knot Theory	*	*	*		
Math4340 Introduction to Complex Variables	*	*	*		
Math4350 Theory of Functions of a Real Variable	*	*	*	R	
Math4360 Introduction to Topology	*	*	*	R	
Math4361 Partial Differential Equations	S	S	*		
Math4365 Dynamical Systems	*	*	*		
Math4750 Numerical Analysis II	S	S	*		
Math4841 Topics in Optimization	S	S	*		
Math4842 Advanced Topics in Optimization	*	*	*		
Math4850 Variational Calculus	*	*	*		
Math4901 Senior Seminar	*	*	R		
Math6025 Algebra for Teachers				*	*
Math6035 Analysis for Teachers				*	*
Math6055 Discrete Mathematics				*	*
Math6065 Connections in Mathematics				*	*
Math6100 Applied Algebra				*	S
Math6121 Advanced Algebra				S	*
Math6151 Graph Theory				*	*
Math6201 Topology				S	*
Math6210 Convex Polytopes				*	*
Math6235 Knot Theory				*	*
Math6250 Differential Geometry				*	*
Math6331 Topics in Differential Equations				*	S
Math6339 Intro to Complex Variables				R	*
Math6340 Complex Analysis				S	*
Math6350 Real Analysis				S	*
Stats 6401 Advanced Probability				*	*
Math6600 Advanced Number Theory				*	*
Math6750 Topics in Advanced Numerical Analysis				*	S
Math6841 Nonlinear Optimization				*	*
Math6842 Advanced Topics in Optimization				*	*
Math6865 Mathematical Modeling				*	*

The Bachelor of Science in Mathematics and the Master of Science in Mathematics require coursework in other programs such as Computer Science and Statistics as shown below.

Degree Components Not Offered Through Mathematics

KEY:

- R** course is required by the program
***** course is an elective in the program

	B.S. in Mathematics Options			Graduate Programs	
	Pure Math	Applied Math	Teaching	Math	Applied Math
CS1160 Introduction to Computer Science I	R	R	R		
CS4170	*	*	*		
CS4245	*	*	*		
CS6870				*	S
STAT3401 Introduction to Probability Theory	*	*	R	*	R
STAT3402	*	*	*	*	*
STAT3502	*	*	*	*	*
STAT3503	*	*	*	*	*
STAT3601	*	*	*		
STAT4401	*	*	*	*	*
STAT4515	*	*	*		
STAT4601	*	*	*		
STAT6401					S

APPENDIX II

B.S. in Mathematics

- I** = PLO is Introduced Required course
D = PLO is Developed Sequence choice
M = PLO is Mastered Elective

	1	2	3	4	5	6
Math1110 The Nature of Mathematics	service course					
Math1130 College Algebra						
CS1160 Introduction to Computer Science I						
Math1300 Trigonometry and Analytic Geometry						
Math1304 Calculus I	I	I	I			
Math1305 Calculus II	I	I	I			
Math1810 Math for Business and Social Sciences	service course					
Math2011 Number Systems	service course					
Math2101 Linear Algebra	I	I	I			
Math2150 Discrete Structures		I	I	I		
Math2304 Calculus III	I		D			I
Math2305 Calculus IV		D			I	I

Math3000 Intro to Abstract Math and Proofs	D			D	D	
Math3100 Linear Algebra	M			M		M
Math3121 Abstract Algebra I	D			D	M	
Math3122 Abstract Algebra II	M			M		M
Math3151 Combinatorics	D			M		
Math3215 Geometry I	D			D	M	
Math3300 Analysis I	D			D	M	
Math3301 Analysis II	M			M		M
Math3331 Differential Equations		D	D			
Math3361 Ordinary Differential Equations		M	M			
Math3600 Number Theory	M		M	M		
Math3750 Numerical Analysis I		M	M			
Math3841 Linear Programming		M	M			
Math3865 Mathematical Modeling		M				
Math3875 Mathematical Physics		M				
Math4012 Geometry and Measure	service course					
Math4013 Statistics, Data Analysis and Probability	service course					
Math4014 Algebra and Functions	service course					
Math4030 Advanced Study of School Mathematics	service course					
Math4040 History of Mathematics					M	
Math4100 Mathematical Logic	M			M		
Math4121 Advanced Algebra				M	M	M
Math4151 Graph Theory	D			M		M
Math4215 Topics in Geometry	M			M		M
Math4235 Introduction to Knot Theory	M			M		M
Math4340 Introduction to Complex Variables	M			M		M
Math4350 Theory of Functions of a Real Variable				M		M
Math4360 Introduction to Topology	M			M		M
Math4361 Partial Differential Equations		M	M	M		
	1	2	3	4	5	6
Math4365 Dynamical Systems		M		M		M
Math4750 Numerical Analysis II		M	M			M
Math4841 Topics in Optimization		M	M			M
Math4842 Advanced Topics in Optimization		M	M			M
Math4850 Variational Calculus		M		M		M
Math4901 Senior Seminar				M	M	

APPENDIX III

B.S. in Mathematics - Applied Option

I = PLO is Introduced

D = PLO is Developed

M = PLO is Mastered

Required course

Sequence choice

Elective

	1	2	3	4	5	6
Math1110 The Nature of Mathematics	service course					
Math1130 College Algebra						
CS1160 Introduction to Computer Science I						
Math1300 Trigonometry and Analytic Geometry						
Math1304 Calculus I	I	I	I			
Math1305 Calculus II	I	I	I			
Math1810 Math for Business and Social Sciences	service course					
Math2011 Number Systems	service course					
Math2101 Linear Algebra	I	I	I			
Math2150 Discrete Structures		I	I	I		
Math2304 Calculus III	I		D			I
Math2305 Calculus IV		D			I	I
Math3000 Intro to Abstract Math and Proofs	D			D	D	
Math3100 Linear Algebra	M			M		M
Math3121 Abstract Algebra I	D			D	M	
Math3122 Abstract Algebra II	M			M		M
Math3151 Combinatorics	D			M		
Math3215 Geometry I	D			D	M	
Math3300 Analysis I	D			D	M	
Math3301 Analysis II	M			M	M	M
Math3331 Differential Equations		D	D			
Math3361 Ordinary Differential Equations		M	M			
Math3600 Number Theory	M		M	M		
Math3750 Numerical Analysis I		M	M			
Math3841 Linear Programming		M	M			
Math3865 Mathematical Modeling		M				
Math3875 Mathematical Physics		M				
Math4012 Geometry and Measure	service course					
Math4013 Statistics, Data Analysis and Probability	service course					
Math4014 Algebra and Functions	service course					
Math4030 Advanced Study of School Mathematics	service course					
Math4040 History of Mathematics					M	
Math4100 Mathematical Logic	M			M		
Math4121 Advanced Algebra				M	M	M
Math4151 Graph Theory	D			M		M
Math4215 Topics in Geometry	M			M		M

Math4235 Introduction to Knot Theory	M			M		M
Math4340 Introduction to Complex Variables	M			M		M
Math4350 Theory of Functions of a Real Variable				M		M
Math4360 Introduction to Topology	M			M	M	M
Math4361 Partial Differential Equations		M	M	M		
Math4365 Dynamical Systems		M		M		M
Math4750 Numerical Analysis II		M	M			M
Math4841 Topics in Optimization		M	M			M
Math4842 Advanced Topics in Optimization		M	M			M
Math4850 Variational Calculus		M		M		M
Math4901 Senior Seminar				M	M	

APPENDIX IV

B.S. in Mathematics - Teaching Option

I = PLO is Introduced

D = PLO is Developed

M = PLO is Mastered

Required course

Sequence choice

Elective




	1	2	3	4	5	6
Math1110 The Nature of Mathematics	service course					
Math1130 College Algebra						
CS1160 Introduction to Computer Science I						
Math1300 Trigonometry and Analytic Geometry						
Math1304 Calculus I	I	I	I			
Math1305 Calculus II	I	I	I			
Math1810 Math for Business and Social Sciences	service course					
Math2011 Number Systems	service course					
Math2101 Linear Algebra	I	I				
Math2150 Discrete Structures		I	I	I		
Math2304 Calculus III	I		D			I
Math2305 Calculus IV		D				I
Math3000 Intro to Abstract Math and Proofs	D			D	D	
Math3100 Linear Algebra	M			M		M
Math3121 Abstract Algebra I	D			D	M	
Math3122 Abstract Algebra II	M			M		M
Math3151 Combinatorics	D			M		
Math3215 Geometry I	D			D	M	
Math3300 Analysis I	D			D	M	
Math3301 Analysis II	M			M		M
Math3331 Differential Equations		D	D			
Math3361 Ordinary Differential Equations		M	M			
Math3600 Number Theory	M		M	M		
Math3750 Numerical Analysis I		M	M			
Math3841 Linear Programming		M	M			

Math3865 Mathematical Modeling		M				
Math3875 Mathematical Physics		M				
Math4012 Geometry and Measure	service course					
Math4013 Statistics, Data Analysis and Probability	service course					
Math4014 Algebra and Functions	service course					
Math4030 Advanced Study of School Mathematics	service course					
Math4040 History of Mathematics					M	
Math4100 Mathematical Logic	M			M		
Math4121 Advanced Algebra				M	M	M
Math4151 Graph Theory	D			M		M
Math4215 Topics in Geometry	M			M		M
Math4235 Introduction to Knot Theory	M			M		M
Math4340 Introduction to Complex Variables	M			M		M
Math4350 Theory of Functions of a Real Variable				M		M
Math4360 Introduction to Topology	M			M		M
Math4361 Partial Differential Equations		M	M	M		
Math4365 Dynamical Systems		M		M		M
Math4750 Numerical Analysis II		M	M			M
Math4841 Topics in Optimization		M	M			M
Math4842 Advanced Topics in Optimization		M	M			M
Math4850 Variational Calculus		M		M		M
Math4901 Senior Seminar				M	M	
Stat 3401 Intro to Probability						

APPENDIX V

M.S. in Mathematics - Pure Option

I = PLO is Introduced
D = PLO is Developed
M = PLO is Mastered




 Required course
 Sequence choice
 Elective

	1	2	3	4	5	6
Math4121 Advanced Algebra	Assessed in Undergrad Plan					
Math4350 Theory of Functions of a Real Variable	Assessed in Undergrad Plan					
Math4360 Introduction to Topology	Assessed in Undergrad Plan					
Math6025 Algebra for Teachers	I				I	
Math6035 Analysis for Teachers	I					
Math6055 Discrete Mathematics		I				I
Math6065 Connections in Mathematics	D		D	D		
Math6100 Applied Algebra		D		D		
Math6121 Advanced Algebra	M			M		
Math6151 Graph Theory		D		D		D
Math6201 Topology	M				M	
Math6210 Convex Polytopes	M				M	
Math6235 Knot Theory	I				I	
Math6250 Differential Geometry	M				M	
Math6331 Topics in Differential Equations		M	M			
Math6339 Intro to Complex Variables	D		D			
Math6340 Complex Analysis	M		M			
Math6350 Real Analysis	M		M			
Math6600 Advanced Number Theory	D			D		
Math6750 Topics in Advanced Numerical Analysis		D				D
Math6841 Nonlinear Optimization		D				D
Math6842 Advanced Topics in Optimization		M				M
Math6865 Mathematical Modeling		I	I			

APPENDIX VI

M.S. in Mathematics - Applied Option

I = PLO is Introduced
D = PLO is Developed
M = PLO is Mastered

 Required course
 Sequence choice
 Elective

	1	2	3	4	5	6
Math3301 Analysis II	Assessed in Undergrad Plan					
Math4401 Introduction to Probability Theory	Assessed in Undergrad Plan					
Math3750 Numerical Analysis I	Assessed in Undergrad Plan					
Math3841 Linear Programming	Assessed in Undergrad Plan					
Math6025 Algebra for Teachers	I				I	
Math6035 Analysis for Teachers	I					
Math6055 Discrete Mathematics		I				I
Math6065 Connections in Mathematics	D		D	D		
Math6100 Applied Algebra		D		D		
Math6121 Advanced Algebra	M			M		
Math6151 Graph Theory		D		D		D
Math6201 Topology	M				M	
Math6210 Convex Polytopes	M				M	
Math6235 Knot Theory	I				I	
Math6250 Differential Geometry	M				M	
Math6331 Topics in Differential Equations		M	M			
Math6339 Intro to Complex Variables	D		D			
Math6340 Complex Analysis	M		M			
Math6350 Real Analysis	M		M			
Stats 6401 Advanced Probability	Assessed by Stats Dept					
Math6600 Advanced Number Theory	D			D		
Math6750 Topics in Advanced Numerical Analysis		D				D
Math6841 Nonlinear Optimization		D				D
Math6842 Advanced Topics in Optimization		M				M
Math6865 Mathematical Modeling		I	I			
CS6870 Computer Simulation	Assessed in CS Plan					