Mathematics and Computer Science (BA/BS)

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Students who want training in both mathematics and computer science can declare a joint mathematics and computer science major. This allows them to develop skills and knowledge in both fields. The program develops team players prepared for information-based jobs. MACS students graduate with the tools to analyze complex problems and to compute the answers to them.

Program Learning Outcomes

Upon successful completion of this program, students will be able to:

- Demonstrate proficiency in the main areas of computer science, including data structures and algorithms, computer systems, programming languages, and software development.
- Draw on broad knowledge of computer science to design, implement, and test software solutions to problems in a variety of areas.
- Demonstrate in-depth understanding of some area of computer science (theoretical foundations, computer systems, software development).
- Demonstrate proficiency with the calculational techniques and applications of calculus and linear algebra.
- Read and write mathematical proofs, producing arguments that are logically and syntactically correct.
- Demonstrate an in-depth understanding of some area of mathematics.
- Communicate and collaborate with others and express ideas orally and in writing.

Mathematics and Computer Science Major Requirements

The requirements for the mathematics and computer science (MACS) major fall into four categories: mathematics, computer science, writing, and science, with 44 credits taken in mathematics, 40 credits in computer science, and 16 credits (science and writing) in other departments.

Computer Science I (CS 210), Computer Science II (CS 211), Computer Science III (CS 212), Elements of Discrete Mathematics I (MATH 231), and Elements of Discrete Mathematics II (MATH 232) must be passed with grades of B– or better before students can take the upper-division core courses. Courses required for the major must be taken for a letter grade. Upper-division courses must be passed with a grade of C– or better.

Code	Title	Credits
Core Courses		
CS 210–212	Computer Science I-III	12
MATH 231–232	Elements of Discrete Mathematics I-II	8
MATH 251–253	Calculus I-III	12
or MATH 261–263	Calculus with Theory I-III	
Mathematics Requirements		
Select one of the following:		
MATH 316	Fundamentals of Analysis I	
MATH 347	Fundamentals of Number Theory I	
MATH 391	Fundamentals of Abstract Algebra I	
MATH 341–342	Elementary Linear Algebra	8
MATH 351–352	Elementary Numerical Analysis I-II	8
or MATH 461–462	Introduction to Mathematical Methods of Statistics I-II	
Upper-level mathematics course [1]		4
Computer Science		
CS 313	Intermediate Data Structures	4
CS 314	Computer Organization	4
CS 315	Intermediate Algorithms	4
CS 425	Principles of Programming Languages	4
Select one of the following:		4
CS 322	Introduction to Software Engineering	
CS 330	C/C++ and Unix	
CS 420	Automata Theory	
CS 422	Software Methodology I	
Two other upper-division CS courses [2]		8
Writing Requirements		
WR 320	Scientific and Technical Writing	4
or WR 321	Business Communications	
Science Requirements		
Select 12 credits from the following:		12
Biology [3]		
BI 211 & BI 213	General Biology I: Cells and General Biology III: Ecology and Evolution	
or BI 211–212	General Biology I-II	
Chemistry [3]		
CH 111	Introduction to Chemical Principles	
or CH 113	The Chemistry of Sustainability	
or CH 221	General Chemistry I	
or CH 224H	Advanced General Chemistry I	
CH 221–223	General Chemistry	
or CH 224H-226H	Honors General Chemistry	
Geography		
GEOG 141	The Natural Environment	
Select two of the following:		
GEOG 321	Climatology	
GEOG 322	Geomorphology	
GEOG 323	Biogeography	
Earth Sciences		
ERTH 201	Dynamic Planet Earth	
ERTH 202	Earth's Surface and Environment	
ERTH 203	History of Life	
Physics [3]		
PHYS 201–203	General Physics	

	or PHYS 251 Foundations of Physics I 253	
Psychology		
PSY 201	Mind and Brain	
Select two of the following:		
PSY 301	Scientific Thinking in Psychology	
PSY 304	Biopsychology	
PSY 305	Cognition	
PSY 348	Music and the Brain	
Total Credits		**96**

1 Excludes Statistical Methods I (MATH 425)

2 Special Studies: [Topic] (CS 399) and Experimental Course: [Topic] (CS 410) courses used as electives must have a prerequisite of Intermediate Data Structures (CS 313) and have regular class meetings and homework assignments. At least one course must be numbered 410 or above.

3 Students are encouraged to complete the accompanying lab courses.

Additional Requirements

Students must earn no grade below a B– in required lower-division mathematics and computer science courses—Computer Science I (CS 210), Computer Science II (CS 211), Computer Science III (CS 212), Elements of Discrete Mathematics I (MATH 231), Elements of Discrete Mathematics II (MATH 232)—for automatic advancement to upper-division computer science courses. At least 12 of the mathematics upper-division credits applied to the degree must be taken in residence at the university. The science courses may be taken pass/no pass (P/N) or for letter grades.

Major Progress Review and Major in Good Standing

Each major must meet with a CS advisor to file a Major Progress Review form after completing 12 credits of the upper-division core, including at least one course from each department. Mathematics and computer science courses and at least 8 credits of upper-division CS courses used to satisfy upper-division major requirements must be taken for letter grades and passed with grades of C– or better. At least 12 of the upper-division mathematics credits and 12 of the upper-division computer science credits applied to the degree must be taken in residence at the university. A student who receives two grades below C– in the upper-division core or three grades below C– in any upper-division courses may be removed from the major.

Code	Title	Credits
MATH 316	Fundamentals of Analysis I	4
MATH 341	Elementary Linear Algebra	4
MATH 342	Elementary Linear Algebra	4
CS 313	Intermediate Data Structures	4
CS 314	Computer Organization	4
CS 315	Intermediate Algorithms	4
CS 425	Principles of Programming Languages	4
One of the following:		
CS 330	C/C++ and Unix	4
CS 420	Automata Theory	4
CS 422	Software Methodology I	4

Honors Program

Both of the cooperating departments offer departmental honors programs to their undergraduate majors. After obtaining advance approval from both of their advisors, students in the joint degree program are eligible to attain honors in mathematics and computer science by meeting the honors requirements of either department, including writing a thesis.

Four-Year Degree Plan

The degree plan shown is only a sample of how students may complete their degrees in four years. There are alternative ways. Students should consult their advisor to determine the best path for them.

Bachelor of Arts in Mathematics and Computer Science

Course	Title	Credits Milestones
First Year		
Fall		
CS 122	Introduction to Programming and Problem Solving	4
MATH 112Z	Precalculus II: Trigonometry	4
WR 121Z	Composition I	4
First term of second-year second-language sequence		4
	Credits	**16**
Winter		
CS 210	Computer Science I	4
MATH 231	Elements of Discrete Mathematics I	4
WR 122Z or WR 123	Composition II or College Composition III	4
Second term of second-year second-language sequence		4
	Credits	**16**
Spring		
CS 211	Computer Science II	4
MATH 232	Elements of Discrete Mathematics II	4
Core-education course in arts and letters		4
Third term of second-year second-language sequence		4
	Credits	**16**
	Total Credits	**48**

Course	Title	Credits Milestones
Second Year		
Fall		
CS 212	Computer Science III	4
MATH 251 or MATH 246 or MATH 261	Calculus I or Calculus for the Biological Sciences I or Calculus with Theory I	4
First course of additional science sequence		4
Core-education course in social science		4
	Credits	**16**
Winter		
CS 313	Intermediate Data Structures	4

MATH 252 or MATH 247 or MATH 262	Calculus II or Calculus for the Biological Sciences II or Calculus with Theory II	4
Second course of additional science sequence		4
Core-education arts and letters		4
	Credits	**16**
Spring		
CS 315	Intermediate Algorithms	4
MATH 253 or MATH 263	Calculus III or Calculus with Theory III	4
Third course of additional science sequence		4
Core-education social science		4
	Credits	**16**
	Total Credits	**48**

Course	Title	Credits	Milestones
Third Year			
Fall			
CS 314	Computer Organization	4	
MATH 316 or MATH 347 or MATH 391	Fundamentals of Analysis I or Fundamentals of Number Theory I or Fundamentals of Abstract Algebra I	4	
CS 322	Introduction to Software Engineering	4	
Core-education course in arts and letters		4	
	Credits	**16**	
Winter			
CS 322	Introduction to Software Engineering	4	
MATH 341	Elementary Linear Algebra	4	
Core-education course in social science		4	
Core-education course in arts and letters that also satisfies cultural literacy requirement		4	
	Credits	**16**	
Spring			
CS 425	Principles of Programming Languages	4	
MATH 342	Elementary Linear Algebra	4	
Core-education course in social science that also satisfies cultural literacy requirement		4	
Elective course		4	
	Credits	**16**	
	Total Credits	**48**	

Course	Title	Credits	Milestones
Fourth Year			
Fall			
MATH 351 or MATH 461	Elementary Numerical Analysis I or Introduction to Mathematical Methods of Statistics I	4	
Upper-division elective course with CS subject code		4	
Elective course		4	
	Credits	**12**	
Winter			
MATH 352 or MATH 462	Elementary Numerical Analysis II or Introduction to Mathematical Methods of Statistics II	4	
Upper-division elective course with CS subject code		4	
Elective course		4	
	Credits	**12**	
Spring			
WR 320 or WR 321	Scientific and Technical Writing or Business Communications	4	
Upper-division elective course with MATH subject code		4	
Elective course		4	
	Credits	**12**	
	Total Credits	**36**	

Bachelor of Science in Mathematics and Computer Science

Course	Title	Credits	Milestones
First Year			
Fall			
MATH 112Z	Precalculus II: Trigonometry	4	
CS 122	Introduction to Programming and Problem Solving	4	
WR 121Z	Composition I	4	
Core-education course in arts and letters		4	
	Credits	**16**	
Winter			
MATH 231	Elements of Discrete Mathematics I	4	
CS 210	Computer Science I	4	
WR 122Z or WR 123	Composition II or College Composition III	4	
Core-education course in social science		4	
	Credits	**16**	
Spring			
MATH 232	Elements of Discrete Mathematics II	4	
CS 211	Computer Science II	4	
Core-education course in arts and letters		4	
Core-education course in social science		4	
	Credits	**16**	
	Total Credits	**48**	

Course	Title	Credits	Milestones
Second Year			
Fall			
MATH 251	Calculus I	4	
CS 212	Computer Science III	4	
Core-education course in arts and letters also satisfies a cultural literacy requirement		4	
First course of additional science sequence		4	
	Credits	**16**	
Winter			
CS 313	Intermediate Data Structures	4	

MATH 247 or MATH 252 or MATH 262	Calculus for the Biological Sciences II or Calculus II or Calculus with Theory II	4
Second course of additional science sequence		4
Core-education course in social science also satisfies a cultural literacy requirement		4
	Credits	**16**
Spring		
CS 315	Intermediate Algorithms	4
MATH 253 or MATH 263	Calculus III or Calculus with Theory III	4
Third course of additional science sequence		4
Core-education course in social science		4
	Credits	**16**
	Total Credits	**48**

Course	Title	Credits	Milestones
Third Year			
Fall			
CS 314	Computer Organization	4	
MATH 316 or MATH 347 or MATH 391	Fundamentals of Analysis I or Fundamentals of Number Theory I or Fundamentals of Abstract Algebra I	4	
CS 322	Introduction to Software Engineering	4	
Core-education course in arts and letters		4	
	Credits	**16**	
Winter			
CS 322	Introduction to Software Engineering	4	
MATH 341	Elementary Linear Algebra	4	
Elective courses		8	
	Credits	**16**	
Spring			
CS 425	Principles of Programming Languages	4	
MATH 342	Elementary Linear Algebra	4	
Elective courses		8	
	Credits	**16**	
	Total Credits	**48**	

Course	Title	Credits	Milestones
Fourth Year			
Fall			
Elective course with a CS subject code		4	
MATH 351 or MATH 461	Elementary Numerical Analysis I or Introduction to Mathematical Methods of Statistics I	4	
Elective course		4	
	Credits	**12**	
Winter			
Elective course with a CS subject code		4	
MATH 352 or MATH 462	Elementary Numerical Analysis II or Introduction to Mathematical Methods of Statistics II	4	
Elective course		4	
	Credits	**12**	
Spring			
Elective course with MATH subject code		4	
WR 320 or WR 321	Scientific and Technical Writing or Business Communications	4	
Elective course		4	
	Credits	**12**	
	Total Credits	**36**	