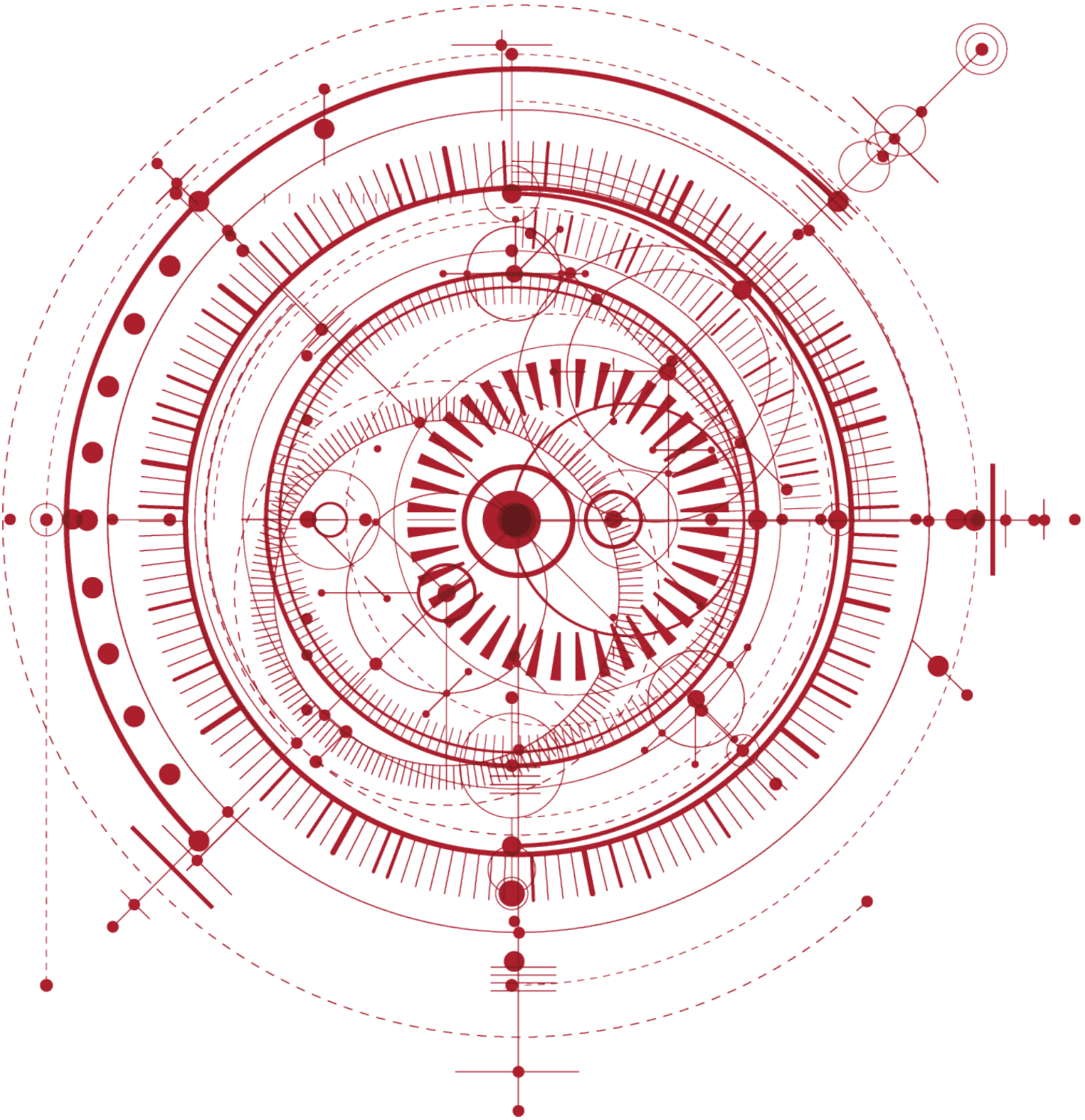
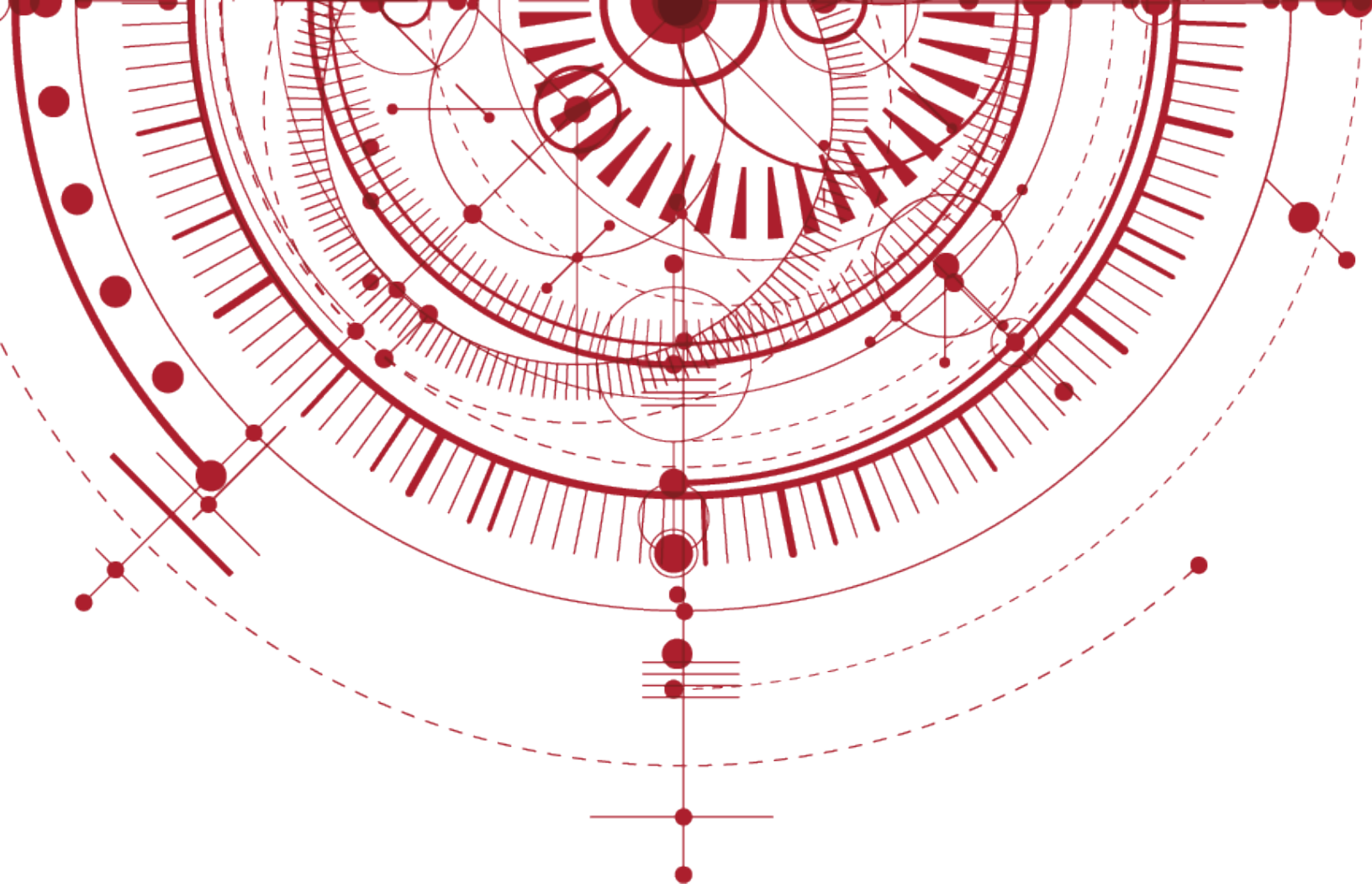


DEPARTMENT OF MATHEMATICS
COLLEGE OF SCIENCE | THE UNIVERSITY OF UTAH

MATHEMATICS MAJORS
AND MINORS



CONTACT INFORMATION

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Director of Undergraduate Studies/
REU Director/Honors Advisor
ugrad_director@math.utah.edu

LAST UPDATED: APRIL 2020

UNDERGRADUATE INFORMATION

Philosophy is written in this grand book, the universe, which stands continually open to our gaze. But the book cannot be understood unless one first learns to comprehend the language and read the letters in which it is composed. It is written in the language of mathematics, and its characters are triangles, circles, and other geometric figures without which it is humanly impossible to understand a single word of it.

--Galileo, 1623

PROGRAM DESCRIPTION

Mathematics majors take Calculus, Linear Algebra, Differential Equations and Foundations of Analysis. Subsequent electives may include Statistics and Probability, Complex Variables, Modern Algebra, Mathematical Finance, Number Theory, Real Analysis, Topology, Dynamical Systems, Differential Equations, Applied Math, Numerical Analysis, and Mathematical Biology. Most majors are required to complete a year of physics, and all are urged to take other science, business or engineering courses, a probability or statistics course, and to attend the Undergraduate Colloquium Series. Mathematics majors are also encouraged to consider internship and research opportunities.

ADVISING

We encourage students to make an appointment with an advisor regarding major declaration, mandatory advising visits, double majoring, the combined BS/MS program, and academic planning. Students should see their academic advisor at least once a year, though students are welcome to come by any time they have questions.

For quick questions, no appointment is necessary to meet with the undergraduate advisors, simply stop by during drop-in advising office hours which are posted at math.utah.edu/ugrad/advising.php.

TRANSFER STUDENTS

Transfer students are encouraged to contact the advisors early in their academic career, even prior to admission to the University of Utah.

To have your math transfer courses evaluated use the Transfer Course Evaluation Form at math.utah.edu/undergrad/registration.php.

Many transfer students will require a permission code to register for math classes their first semester. See math.utah.edu/undergrad/registration.php for more information.

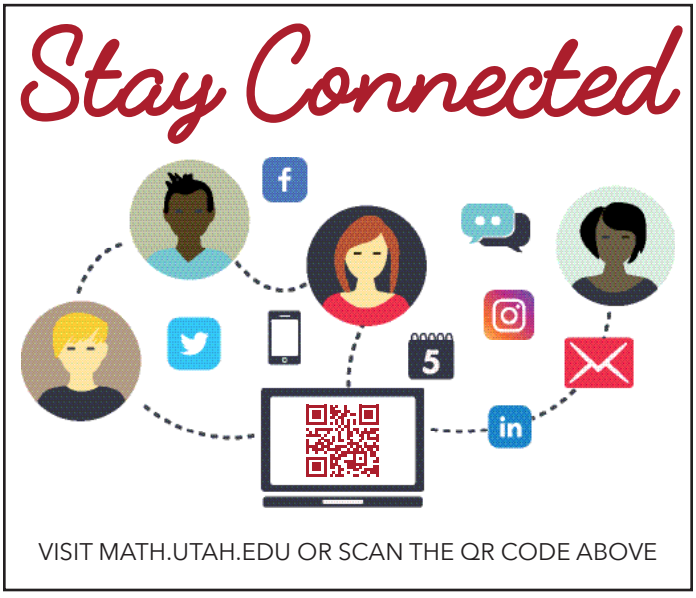
Math majors who need transfer courses evaluated for general education or bachelor's degree requirements may email the course description and syllabus to advisor@math.utah.edu.

AP CREDIT

A score of 3, 4 or 5 on the AP Calculus AB test or a score of 3 or 4 on the AP Calculus BC test is awarded six semester hours of credit. A score of 5 on the AP Calculus BC test is awarded eight hours of semester credit. The math department uses AP test scores to determine course placement as follows:

Test	Score	Course
AB	3	MATH 1210
AB	4	MATH 1220 or 1250
AB	5	MATH 1250 or 1220
BC	3	MATH 1220
BC	4 or 5	MATH 1260 or 2210

NOTE: MATH 1250-1260 covers in two semesters roughly the same material covered by MATH 1210-1220-2210 in three semesters. The MATH 1250-1260 sequence also covers the material in a more in-depth and theoretical manner.



GRADUATION REQUIREMENTS

UNIVERSITY REQUIREMENTS

Minimum University Requirements

Total Credits Requirement	122
Upper Division Hours (3000 Level or Higher at U of U)	40
U of U Residence Hour Requirement	30
(20 of last 30 hours must be earned in residence. Independent Study credits do not count as resident credits.)	
General Education Credits	See Below
Minimum GPA	2.0
Completion of Major Requirements	See Below
Completion of minor (if desired)	See Dept.

General Education Requirements

- **American Institutions (AI):**
  HIST 1700 or ECON 1740 or POLS 1100
- **Writing (WR):**
  WRTG 2010 or EAS 1060
- **Quantitative Reasoning (QA/QB):**
  Calculus I fills both the QA and QB requirements (or waived by AP credit).
- **Intellectual Explorations (IE):**
  Two courses must be taken from each of the following areas: Fine Arts (FF), Humanities (HF), and Social Sciences (BF).

Bachelor Degree Requirements

- **Upper Division Communication/Writing (CW):**
  One course chosen from an approved list (MATH 3010 fulfills this requirement, or you may choose from the list of approved courses in the Undergraduate Bulletin).
- **Diversity Requirement (DV):**
  One 3-credit course chosen from an approved list.
- **International Requirement (IR):**
  One course chosen from an approved list.
- **B.S. or B.A. Requirements:**
  Math major courses fulfill both B.S. QI requirements. The B.A. requirement will be filled with a fourth semester of a upper division language course or credit by special exam.

MATH DEPARTMENT REQUIREMENTS

In addition to the required coursework outlined in this publication, all math majors are required to:

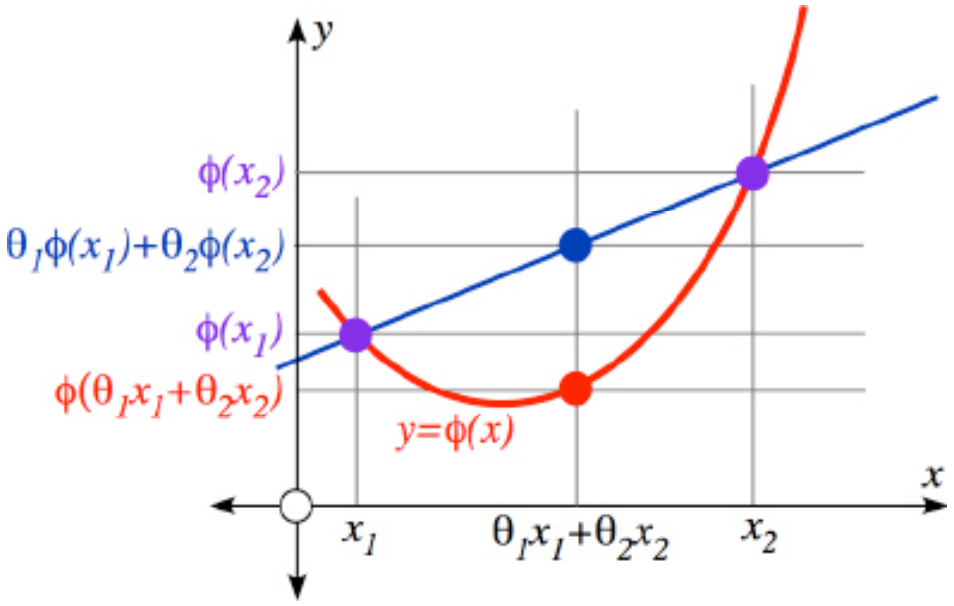
1. Receive a "C or better in all math courses (this applies to the minor as well)" and a "C- or better in allied courses". **Mathematics Teaching Majors** must receive a "C+ or better in all math courses" and a "C or better in physics."
2. Maintain a minimum GPA of 2.3 in mathematics courses. **Mathematics Teaching Majors** must maintain a minimum GPA of 2.8 in mathematics courses.
3. Complete at least 18 upper division credit hours of University of Utah mathematics courses.
4. Successfully pass, with a "C or better (C+ or better for **Mathematics Teaching Majors**) in all mathematics courses" within 3 attempts. Failure to pass any mathematics course with a "C or better" within 3 attempts will result in dismissal from the major. A withdrawal will be considered an attempt.
5. An exit survey is required the semester a student graduates.

NOTE: Qualified students are encouraged to substitute MATH 1250-1260 for MATH 1210-1220-2210. Students who have taken courses in the engineering math sequence should see an Undergraduate Advisor to review how those courses will fill requirements in the major.

REQUIREMENT CHANGES

Students are generally held to the Department of Mathematics graduation requirements in place at the time they declare their major. Students who interrupt their studies may be held to the graduation requirements in place when they re-enter the University. Graduation requirements shown on this sheet are deemed to be reliable, however, it is the student's responsibility to check with the advisors periodically concerning possible changes or corrections.

MATHEMATICS MAJOR B.S./B.A.



REQUIRED COURSES

	MATH 1210	Calculus I	4
	MATH 1220	Calculus II	4
	MATH 2210	Calculus III	3
	MATH 2270	Linear Algebra	4
	MATH 2280	Differential Equations	4
	MATH 3210	Foundations of Analysis I	4
	MATH 3220	Foundations of Analysis II	4

ALLIED COURSES

	PHYS 2210 or PHYS 3210	Physics for Scientists and Engineers I	4
	PHYS 2220 or PHYS 3220	Physics for Scientists and Engineers II	4

Select one course from the list below, or see advisors about approval of courses not on this list:

	COMP 1020	Programming for All II: Extending Applications	3
	CS 1410	Intro to Object- Oriented Programming	4
	MATH 4100	Intro to Data Science	3
	PHYS 3730	Intro to Computing in Physics	4

ELECTIVE COURSES

Seven different semester courses in the Department of Mathematics chosen from MATH 2200 - Intro to Discrete Mathematics (or CS 2100) and any math course numbered 4200 or higher, **EXCEPT do not take the following courses**:

MATH 4910, MATH 4950, MATH 4999, MATH 5000, MATH 5140, MATH 5150, MATH 5155, MATH 5160, MATH 5165, MATH 5270, MATH 5280, MATH 5700, MATH 5960, MATH 5969, and MATH 5910.

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MATHEMATICS MAJOR WITH STATISTICS EMPHASIS

B.S./B.A.

REQUIRED COURSES

	MATH 1210	Calculus I	4
	MATH 1220	Calculus II	4
	MATH 2210	Calculus III	3
	MATH 2270	Linear Algebra	4
	MATH 3070	Applied Statistics I	4
	MATH 3080	Applied Statistics II	3
	MATH 3210	Foundations of Analysis I	4
	MATH 3220	Foundations of Analysis II	4
	MATH 5010	Intro to Probability	3
	MATH 5080	Statistical Inference I	3
	MATH 5090	Statistical Inference II	3

ALLIED COURSES

Select two courses from the list below, or see the undergraduate advisors about approval of courses not on this list.

NOTE: MATH 4100 - Introduction to Data Science and STAT 5003 - Survey of Statistical Packages may be used to fill **ONLY** one allied requirement. Also, if QAMO 3020 - Game Theory is used as an allied course, then MATH 5750 - Game Theory may **NOT** also be used as an elective course.

	ECON 4010	Microeconomic Analysis	3
	ECON 4020	Macroeconomic Analysis	3
	FINAN 3000	Fundamentals of Investing	3
	FINAN 3040	Financial Management	3
	FINAN 3050	Intro to Investments	3
	MATH 4100	Intro to Data Science	3
	STAT 5003	Survey of Statistical Packages	3
	QAMO 3010	Business Economics	3
	QAMO 3020	Game Theory	3
	QAMO 3030	Business Econometrics I	3
	QAMO 3040	Business Econometrics II	3

ALLIED COMPUTING COURSES

Select one course from the list below:

NOTE: MATH 4100 - Introduction to Data Science and STAT 5003 - Survey of Statistical Packages may be used to fill **ONLY** one allied requirement.

	COMP 1020	Programming for All II: Extending Applications	3
	CS 1410	Intro to Object- Oriented Programming	4
	MATH 4100	Intro to Data Science	3
	STAT 5003	Survey of Statistical Packages	3

ELECTIVE COURSES

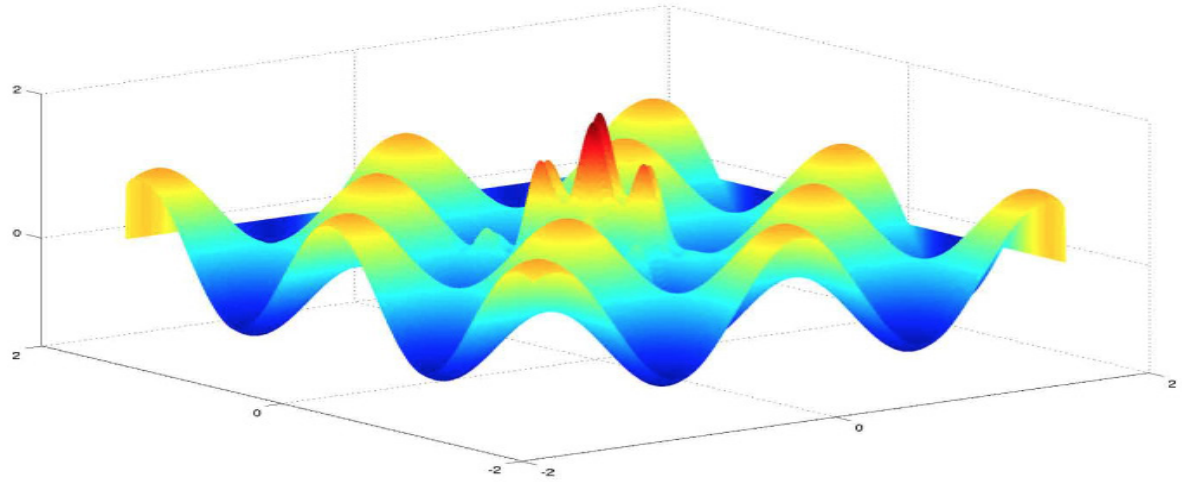
Select four courses from the list below:

NOTE: If QAMO 3020 - Game Theory is used as an allied course, then MATH 5750 - Game Theory may **NOT** also be used as an elective course.

	MATH 2200	Discrete Mathematics (or CS 2100)	3
	MATH 4200	Complex Variables	3
	MATH 4400	Intro to Number Theory	3
	MATH 4600	Math in Medicine	4
	MATH 5030	Actuarial Math	3
	MATH 5040	Stochastic Processes I	3
	MATH 5050	Stochastic Processes II	3
	MATH 5075	Time Series Analysis	3
	MATH 5210	Real Analysis	4
	MATH 5405	Codes and Cryptography	3
	MATH 5410	Intro to ODEs	4
	MATH 5420	ODEs and Dynamical Systems	3
	MATH 5610	Intro to Numerical Analysis I	4
	MATH 5620	Intro to Numerical Analysis II	4
	MATH 5710	Applied Mathematics I	3
	MATH 5750	Topics in Applied Math	3
	MATH 5760	Mathematical Finance I	3
	MATH 5765	Mathematical Finance II	3
	MATH 5770	Intro to Optimization	3

MATHEMATICS MAJOR WITH MATHEMATICS OF COMPUTATION EMPHASIS

B.S./B.A.



REQUIRED COURSES

	MATH 1210	Calculus I	4
	MATH 1220	Calculus II	4
	MATH 2210	Calculus III	3
	MATH 2270	Linear Algebra	4
	MATH 2280	Differential Equations	4
	MATH 3210	Foundations of Analysis I	4
	MATH 3220	Foundations of Analysis II	4
	MATH 5610	Intro to Numerical Analysis I	4
	MATH 5620	Intro to Numerical Analysis II	4
	MATH 5960	Undergraduate Special Project	4

ALLIED COURSES

	PHYS 2210 or PHYS 3210	Physics for Scientists and Engineers I	4

Select two courses from the list below:

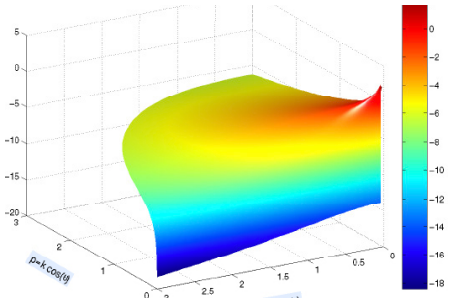
	PHYS 2220 or PHYS 3220	Physics for Scientists and Engineers II	4
	CS 1410	Intro to Object - Oriented Programming	4
	CS 2420	Intro to Algorithms and Data Structures	4

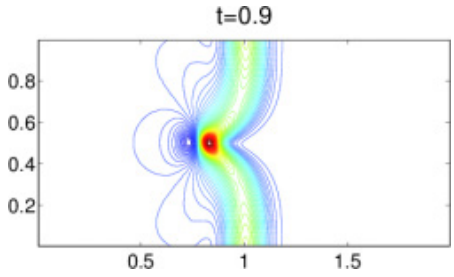
ELECTIVE COURSES

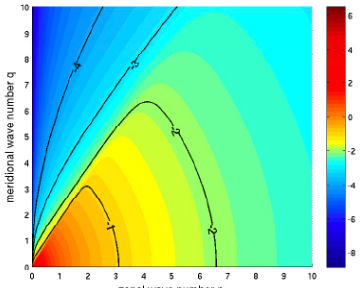
Select four courses from the list below:

	MATH 2200	Discrete Mathematics (or CS 2100)	3
	MATH 4400	Intro to Number Theory	3
	MATH 4800	Introduction to Research	3
	MATH 5010	Probability	3
	MATH 5040	Stochastic Processes I	3
	MATH 5050	Stochastic Processes II	3
	MATH 5075	Time Series Analysis	3
	MATH 5080	Statistical Inference I	3
	MATH 5090	Statistical Inference II	3
	MATH 5110	Math Biology I	3
	MATH 5120	Math Biology II	3
	MATH 5405	Codes and Cryptography	3
	MATH 5410	Intro to ODEs	4
	MATH 5420	ODEs and Dynamical Systems	3
	MATH 5440	Partial Differential Equations	3
	MATH 5470	Chaos and Nonlinear Systems	3
	MATH 5710	Applied Mathematics I	3
	MATH 5740	Mathematical Modeling	3
	MATH 5750	Topics in Applied Mathematics	3
	MATH 5760	Mathematical Finance I	3
	MATH 5765	Mathematical Finance II	3
	MATH 5770	Introduction to Optimization	3

APPLIED MATHEMATICS MAJOR B.S.







REQUIRED COURSES

	MATH 1210	Calculus I	4
	MATH 1220	Calculus II	4
	MATH 2210	Calculus III	3
	MATH 2200	Discrete Mathematics (or CS 2100)	3
	MATH 2270	Linear Algebra	4
	MATH 2280	Differential Equations	4
	MATH 3210	Foundations of Analysis I	4
	MATH 3220	Foundations of Analysis II	4
	MATH 4200 or MATH 3160	Complex Variables/ Applied Complex Variables	3/2
	MATH 5010 or MATH 3070	Probability/ Applied Statistics I	3/4
	MATH 5600 or MATH 5610	Survey of Numerical Analysis/ Intro to Numerical Analysis I	4

ALLIED COURSES

	PHYS 2210 or PHYS 3210	Physics for Scientists and Engineers I	4
	PHYS 2220 or PHYS 3220	Physics for Scientists and Engineers II	4

Select one course from the list below:

	COMP 1020	Programming for All II: Extending Applications	3
	CS 1410	Intro to Object-Oriented Programming	4
	MATH 4100	Intro to Data Science	3
	PHYS 3730	Intro to Computing in Physics	4

ELECTIVE COURSES

Select four courses from the list below:

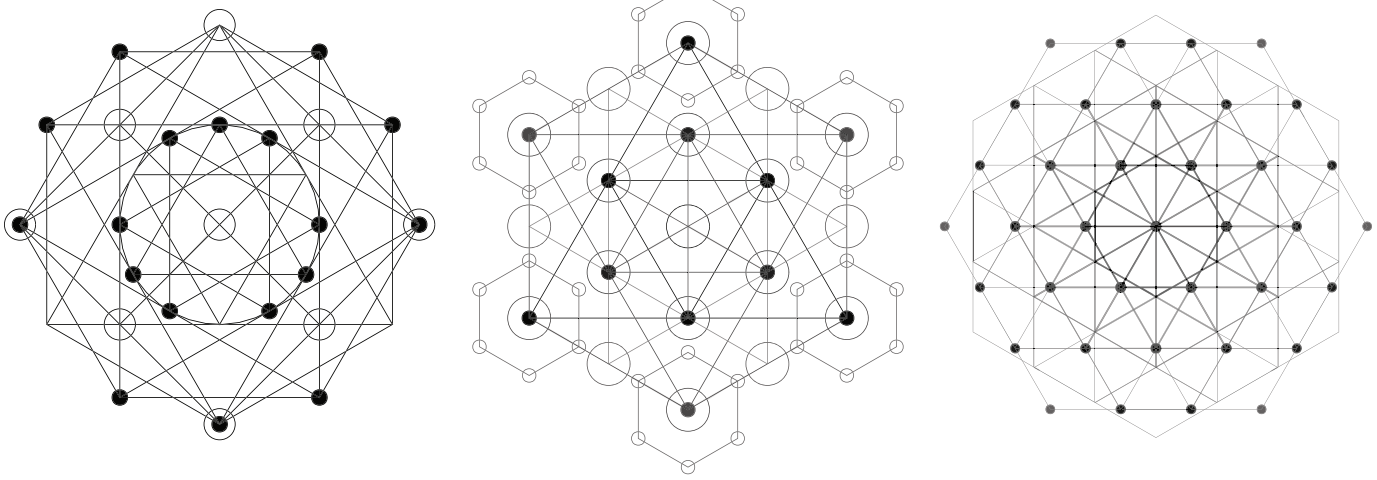
NOTE: Up to three courses from other departments may be substituted provided they have significant mathematical content and advisor approval.

	MATH 4400	Intro to Number Theory	3
	MATH 4600	Mathematics in Medicine	4
	MATH 4800	Introduction to Research	3
	MATH 5030	Actuarial Mathematics	3
	MATH 5040	Stochastic Processes I	3
	MATH 5050	Stochastic Processes II	3
	MATH 5080	Statistical Inference I	3
	MATH 5090	Statistical Inference II	3
	MATH 5075	Time Series Analysis	3
	MATH 5110	Mathematical Biology I	3
	MATH 5120	Mathematical Biology II	3
	MATH 5210	Real Analysis	4
	MATH 5310	Modern Algebra I	3
	MATH 5405	Codes and Cryptography	3
	MATH 5410	Intro to ODEs	4
	MATH 5420	ODEs and Dynamical Systems	3
	MATH 5440	Intro to PDEs	3
	MATH 5470	Chaos and Nonlinear Systems	3
	MATH 5500	Calculus of Variations	3
	MATH 5510	Intro to Topology	3
	MATH 5620	Intro to Numerical Analysis II	4
	MATH 5710	Applied Mathematics I	3
	MATH 5740	Mathematical Modeling	3
	MATH 5750	Topics in Applied Math	3
	MATH 5760	Mathematical Finance I	3
	MATH 5765	Mathematical Finance II	3
	MATH 5770	Introduction to Optimization	3

MATHEMATICS TEACHING MAJOR

Mathematics Teaching Majors must receive a C+ or better in all math courses.

B.S./B.A.



REQUIRED COURSES

	MATH 1210	Calculus I	4
	MATH 1220	Calculus II	4
	MATH 2210	Calculus III	3
	MATH 2200	Discrete Mathematics	3
	MATH 2270	Linear Algebra	4
	MATH 2280	Differential Equations	4
	MATH 3070	Applied Statistics I	4
	MATH 3210	Foundations of Analysis I	4
	MATH 3410	Statistics for Secondary Mathematics Teachers	3
	MATH 3420	Geometry for Secondary Mathematics Teachers	3
	MATH 3430	Algebra for Secondary Mathematics Teachers	3
	MATH 3100	Foundations of Geometry	3
	MATH 4030	Foundations of Algebra	3
	MATH 4090	Teaching of Secondary School Mathematics	3
	MATH 4095	Practicum for Secondary Math Teachers	2

ELECTIVE COURSE

Select one course from the list below, or another course numbered 4200 or above except those excluded from the regular mathematics major.

	MATH 3220	Foundations of Analysis II	4
	MATH 4400	Intro to Number Theory	3

ALLIED COURSES

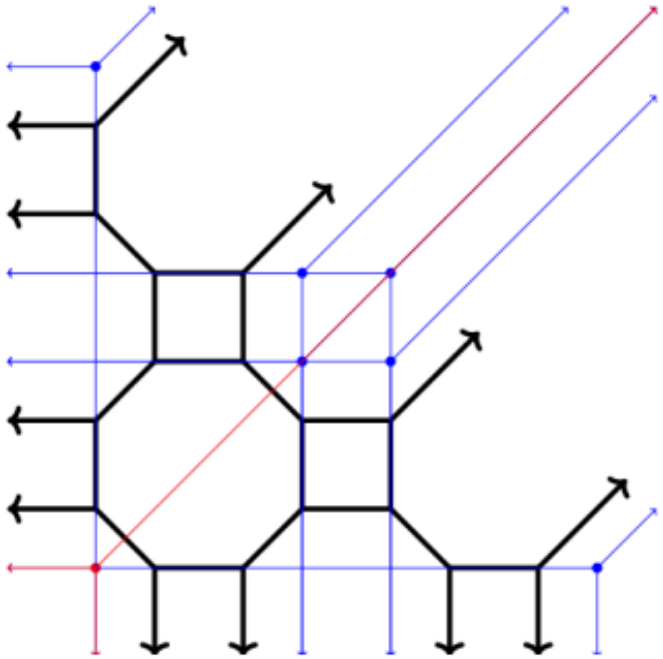
	PHYS 2210 or PHYS 3210	Physics for Scientists and Engineers I (The Department of Mathematics strongly advises students to complete the physics sequence)	4
	Students **MUST** complete the Secondary Teacher Licensure Program through the Urban Institute for Teacher Education (UITE). See uite.utah.edu/advising.php to schedule an appointment regarding licensure program requirements.		
	It is strongly recommended that students complete a teaching minor in another subject area.		

COMPREHENSIVE EXAM

To graduate with a mathematics teaching major students must receive a score of **165** or higher on the Praxis Exam #5161: "Mathematics: Content Knowledge." To register see ets.org/praxis.

HONORS DEGREE IN MATHEMATICS

In order to pursue an Honors Degree in Mathematics, students must first be admitted to the Honors College. Students must complete the coursework required by the Honors College as well as the mathematics coursework. For more information please see the Department of Mathematics Undergraduate Advisors.



DEPARTMENT REQUIREMENTS

In addition to the requirements for the mathematics degree you have selected, the following requirements apply to those students seeking an Honors Degree:

	MATH 3000	Undergraduate Colloquium	1
	B or better in all courses required for major		
	Math GPA of at least 3.5		
	Overall GPA of at least 3.5		

HONORS COLLEGE REQUIREMENTS

	2 Intellectual Traditions Courses	6
	1 Honors Writing Course	3
	1 Honors Science Course	
	Honors Electives	9
	Honors Thesis (MATH 4999)	3

OPTIONAL HONORS SCIENCE/ELECTIVE MATH COURSES

Courses offered by the Department of Mathematics that fill Honors elective requirements are:

	MATH 1250	AP Calculus I	4
	MATH 1260	AP Calculus II	4
	MATH 3210	Foundations of Analysis I	4
	MATH 3220	Foundations of Analysis II	4
	MATH 4200	Intro to Complex Variables	3
	MATH 4800	Intro to Research	3
	MATH 5210	Intro to Real Analysis	4

Students in the Honors College are encouraged to visit with their Honors Advisor, Department of Mathematics Faculty Honors Advisor, and Department of Mathematics Undergraduate Advisor to check their progress.

MATHEMATICS

MINOR

Mathematics Minors must receive a C or better in all math courses.

REQUIRED COURSES

	MATH 1210	Calculus I	4
	MATH 1220	Calculus II	4
	MATH 2210	Calculus III	3
	MATH 3210	Foundations of Analysis I	4
	MATH 3220 **OR** MATH 4200 or higher*	Foundations of Analysis II **OR** Selection from approved upper division courses	4

***NOTE:** To fulfill requirement, student must take Math 3220 or any Math course numbered 4200 or higher, **EXCEPT do not take the following courses::**

MATH 4910, MATH 4950, MATH 4999, MATH 5000, MATH 5140, MATH 5150, MATH 5155, MATH 5160, MATH 5165, MATH 5270, MATH 5280, MATH 5700, MATH 5960, MATH 5969, and MATH 5910.

ELECTIVE COURSES

Select three Department of Mathematics courses with a **prerequisite of at least Calculus II**. Please have your course choices approved by the Undergraduate Advisors.

NOTE: One elective **MUST** be MATH 2200 (recommended), MATH 2270, or MATH 2250 in order to satisfy prerequisites for Foundations of Analysis.

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MATHEMATICS TEACHING

MINOR

Mathematics Teaching Minors must receive a C or better in all math courses.

REQUIRED COURSES

	MATH 1210	Calculus I	4
	MATH 1220	Calculus II	4
	MATH 2210	Calculus III	3
	MATH 2270	Linear Algebra	4
	MATH 3070	Applied Statistics I	4
	MATH 3100	Foundations of Geometry	3
	MATH 3430 **OR** MATH 4030	Algebra for Secondary Mathematics Teachers/ Foundations of Algebra	3
	MATH 4090	Teaching Secondary School Mathematics	3
	MATH 4095	Practicum for Secondary Math Teachers	2

NOTE: Although MATH 2200 is not on this list, it is a prerequisite for some of the courses on this list.

The Mathematics Teaching Minor is available **ONLY** to students completing a teaching major in another subject.

NOTES AND PLANNING:

Fall	Spring	Summer
Fall	Spring	Summer
Fall	Spring	Summer
Fall	Spring	Summer
Fall	Spring	Summer